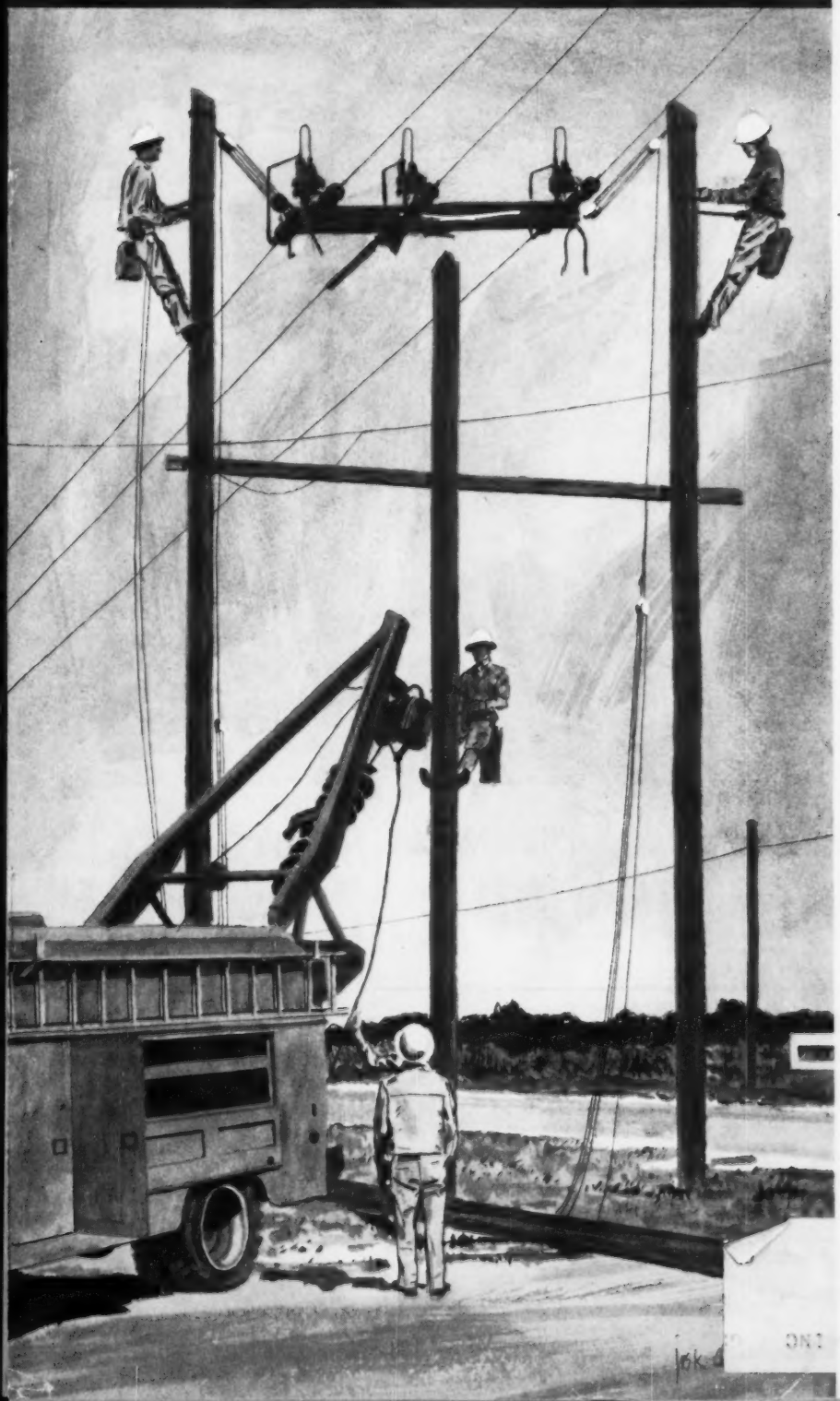
A McGraw-Hill Publication

October 23, 1961

# Electrical World

Price One Dollar

The Electrical Industry's Weekly Magazine



Fifth of Six Reports for 1961

Eum

Starts on p 53

## Suspend Live Gang Switch to Replace Pole

UNIV MICROFILMS INC
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# ALLIS-CHALMERS

*"Originators of 5/8% Step Regulators"*

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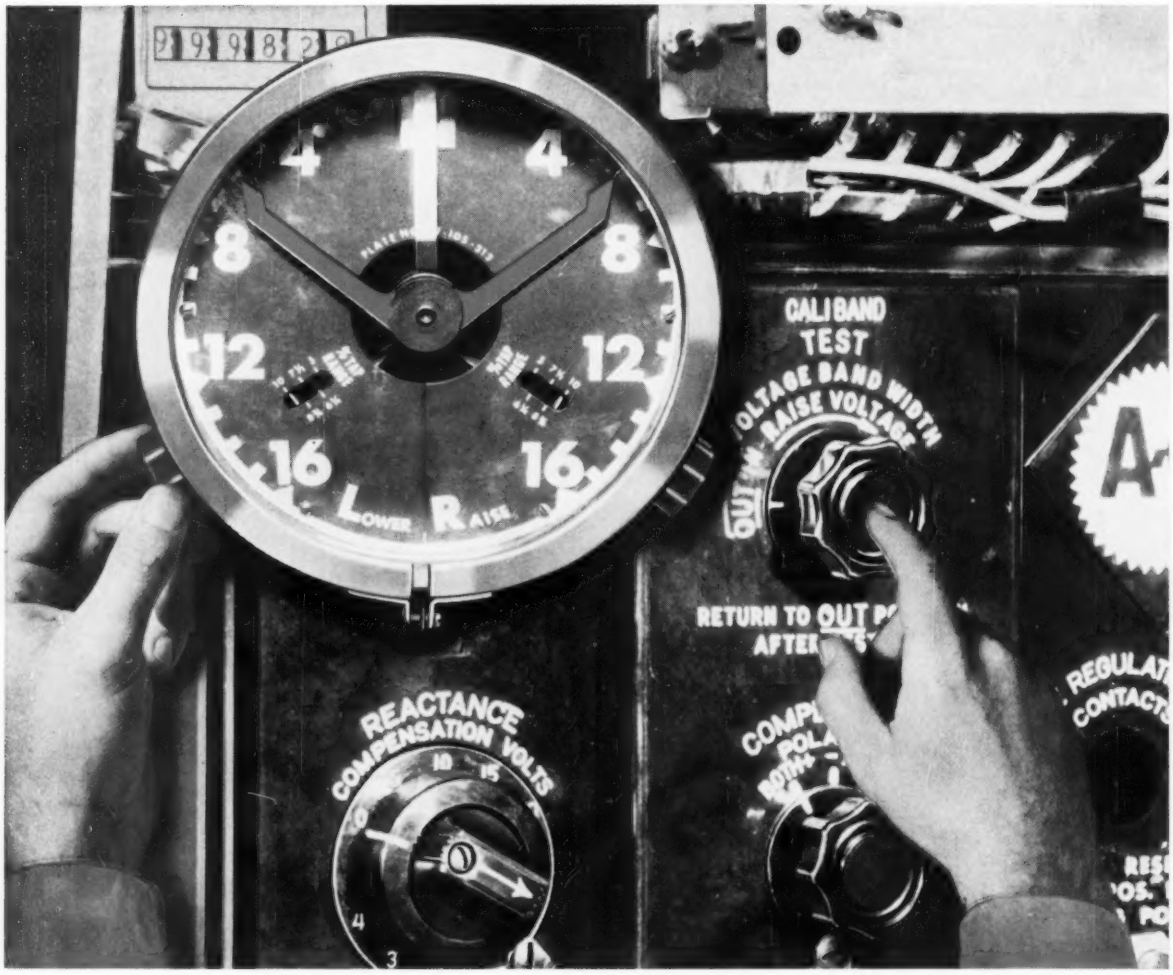


## All hands point to user benefits as

# A-C Regulators Offer DOLLAR Savings!

SAVE DOLLARS — with a turn of the snap-action *Vari-Amp* position indicator knob. Left hand adjusts regulation limits, permits higher regulator currents. Buy a smaller Allis-Chalmers unit to provide tailored regulation or continue to use existing Allis-Chalmers regulators as load current increases.

SAVE DOLLARS — Right hand indicates *Caliband* test rheostat which will cut control setting time for reduced operating cost — increase accuracy for greater revenue. And exclusive *Caliband* test rheostat works without disturbing system voltage; without requiring adjustment of line-drop compensator controls.

SAVE DOLLARS — with position indicator drag hand electrically resettable from control panel. Remote mounting of control allows *one* man to operate both control and drag hand reset from ground — pole climbing not required; saves on poles. And you can record tap range, check feeder operation, plan changes to boost dollar return.

Call, wire or write your nearby **Allis-Chalmers** office for ALL the JFR regulator DOLLAR-SAVING facts!

*Vari-Amp* and *Caliband* are Allis-Chalmers trademarks.

Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

# Electrical World

October 23, 1961
Vol. 156, No. 17

## Dateline . . .

### New Power Service Uprising in South Dakota

**Rapid City, S. D.**— What has been a fairly smooth working relationship between an investor-owner electric utility and the neighboring cooperatives is beginning to develop some rough edges.

Problems arose when the Air Force announced it was going to build Minuteman missile launching bases in the area around Ellsworth AFB, near here. Black Hills Power & Light Co and four co-ops were invited to bid on providing electric service to the sites. The four co-ops are: Butte Electric at Newall, West River Electric at Wall, Grand Electric at Bison, and Black Hills Cooperative at Custer.

On June 12, the Air Force received a bid of $7,881,625 from Black Hills P&L, and $11,075,129 (total) from the four co-ops. This was to supply power for a ten-year period. The company gave a flexible, all-or-any-part bid, but the co-ops bid on an all-or-nothing basis.

Because of this "difference" in bidding "concepts," the Air Force asked for new bids. On July 21, the new bids came in, with Black Hills' staying the same, but the co-ops with a new figure of $7,595,396—$3,479,733 below the original.

Black Hills P&L says that it was notified by the Air Force, after the first bid, that its bid was lowest and best, and that the utility could plan on furnishing power.

Biggest lump whacked from the co-ops' first bid was under the heading of funding Bureau of Reclamation lines. Originally the figure for this was $2,510,000, but the second bid allowed only $335,000 for this purpose. In addition, the co-ops dropped all "connection charges," which completed the total difference between the first and second bids. There are "connection charges" in the Black Hills bid, too. Where the $2,175,000 difference for funding Bureau lines is being absorbed is something of a mystery. It may be pro-rated among the four co-ops and charged off to other customers, or it may turn up in Bureau of Reclamation expenses involved with building new transmission lines to the region.

(*Continued on page 5*)

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# For Operating Security and Efficiency We Approve Lapp Hi-F

*"We've learned to be skeptical of 'new' insulator designs. We want proof of reliability in service before we approve changes in standards.*

*"That's one reason we're strong for Lapp's* **Hi-F** *suspension insulator. The only thing 'new' we see here is the idea—of combining time-proved and field-tested components in a new assembly. We don't believe we're risking any of the hazards usually inherent in 'new' insulator designs when we use Lapp* **Hi-F.**

*"And we certainly do appreciate the convenience and economy —in handling, and for hot-line work—of its smaller diameter and lighter weight!"*

Lapp ***Hi-F*** is a "non-standard" suspension insulator made up of "standard" components. Its head design comes from Lapp's No. 6605 6" deadend (EEI-NEMA-52-1) which, with an M&E rating of 10,000 lbs., routinely tests at 16,000 to 19,000 lbs. The porcelain shell of ***Hi-F*** provides the same leakage distance and flashover values as the standard (EEI-NEMA-52-3) 10" suspension insulator. But because the head is 1" smaller, the porcelain can also be 1" smaller. And the total weight one-third less. Rated 14,000 lbs. M&E strength, Lapp ***Hi-F*** may be used with confidence for any suspension or dead-end application up to 7,000 lbs. working load —at savings, in cost and labor of handling, that are substantial.

Lapp Insulator Co. Inc., LeRoy, N. Y.

## Dateline . . .

**Rapid City, S. D.** (*Continued from page* 3)

The Bureau of Reclamation seized the opportunity and got House Appropriations Committee approval to re-program $3 million of the 1962 budget to build transmission facilities from Oahe Dam on the Missouri River to Rapid City to supply power for the 12 missile sites through the co-ops. The 115-kv line, which would eventually cost some $4.7 million, would actually become the northern part of a USBR loop covering much of western South Dakota.

Black Hills P&L is objecting to the whole chain of events. For one thing, it says it already has basic lines adequate to serve the missile sites. Besides this, it is interconnected with the co-ops, and even has 26.5 Mw of co-op-owned generation in its own stations. Of this amount, only 7.1 Mw is being used by the co-ops for their own needs at this time, so the remainder is available for the missile sites.

To be considered, too, is the fact that each of the missile sites has its own 1-Mw diesel electric generating unit for standby.

Black Hills P&L executives believe this is a clear-cut case of the federal government hiding behind co-op and defense skirts while proceeding with its own electrical industry empire-building.

Kenneth Holum, assistant secretary of Interior, is credited by the *South Dakota Highliner,* a statewide REA publication, with "helping the cooperatives obtain the Air Force contracts to serve missile sites." How he helped the cooperatives of his home state is not documented—if he did help.

At this point, according to an Air Force source, the contracts with the four co-ops have not been "finalized," by Ellsworth AFB, or "terminalized" at Wright-Patterson AFB, both of which (whatever they are) must be done before the deal is closed. Still pending is approval of their rate structures and technical sufficiency, and this is considered to be merely routine.

## Letters

### In What Was the Adams Plant First?

▶ We would welcome reader's comments on these points raised by Thomas Lucier of Brown Boveri Corp.:

To the Editor:

One of the favorite pastimes of public relations and advertising people is to concoct lists of their company's engineering firsts. This is a harmless enough PR ploy of which Brown Boveri is as "guilty" as the next company. Since these claims are usually as carefully hedged as a politician's campaign promises they are seldom taken seriously.

But the danger is that these innocuous claims can occasionally run afoul of serious history. . . . Something like this would seem to have happened in the case of the hydro-generators installed at the Edward Dean Adams station at Niagara Falls, soon to be shut down after some 66 years. We note from *Electrical World* of September 4 that a Citizens' Committee at Niagara Falls is backing the idea of converting the Adams station into a museum. . . .

Undoubtedly the Adams station was properly regarded as a major engineering accomplishment at the time of its construction. But the record becomes cloudy when we examine the question of what it is about the Adams station that is to be memorialized.

Is it the world's first hydroelectric power plant? Obviously not. . . . Is it the world's first alternating current power plant? . . . A quick reading of the record leads us to the municipal power plant at Frankfurt, Germany, placed in service in October 16, 1894. . . . But, unusual as it undoubtedly was, even the Frankfurt plant cannot itself lay claim to being the first ac power plant, although placed in operation two years ahead of Niagara. This claim was not even made for an ac steam plant at Koln, Germany, put on the line in 1892.

Was it the first ac hydro plant using a long-distance transmission line? . . . Going back no farther than the accomplishments of C. E. L. Brown, co-founder of Brown Boveri, we find that he, while still employed by a major German concern, advanced a plant to transmit ac from a hydroelectric plant at Lauffen on the Neckar

(*Continued on page* 128)

**ELECTRICAL WORLD**
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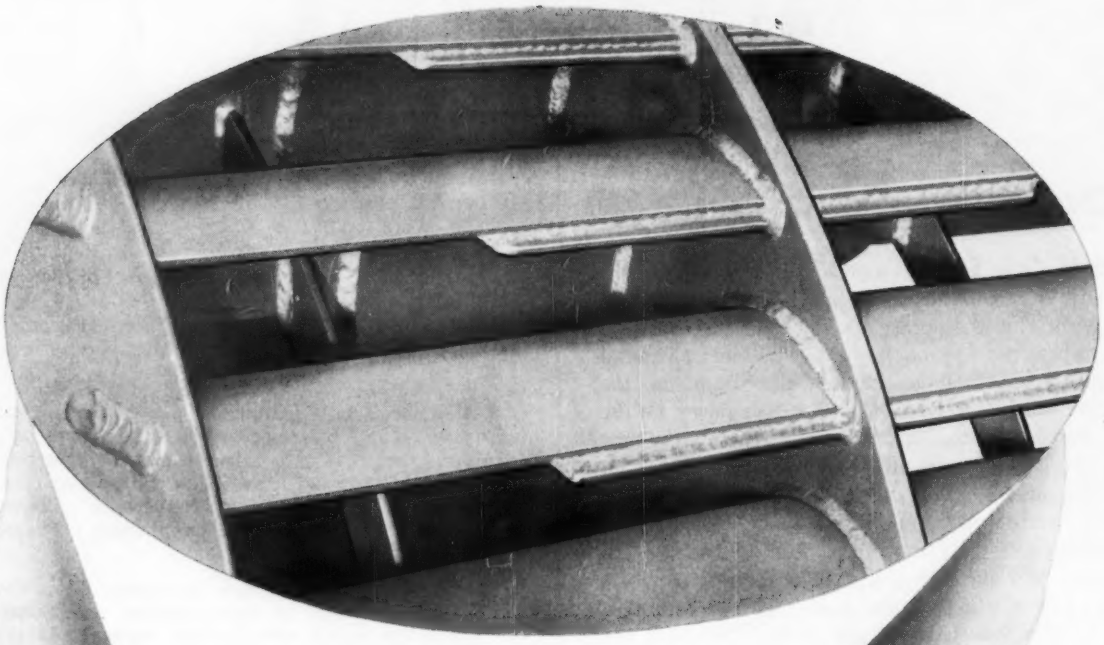
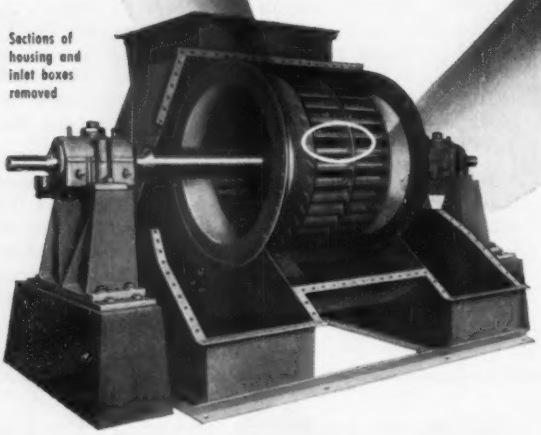


**RIGHT WHERE THEY BELONG . . . *wearing plates on the FACE of the blades***



Sections of housing and inlet boxes removed

Here's another feature you get only from Clarage. The Type DN Dynacurve induced draft fan, when equipped with wearing plates, has these abrasion-resisting steel plates welded to the *face* of the wheel blades.

Result: *extra* service life.

Don't settle for less. Choose the Clarage Dynacurve fan with its rugged wheel of 36 radially deep blades . . . minimum floor space and height requirements . . . bolted scroll liners for easy replacement . . . and numerous other distinctive features.

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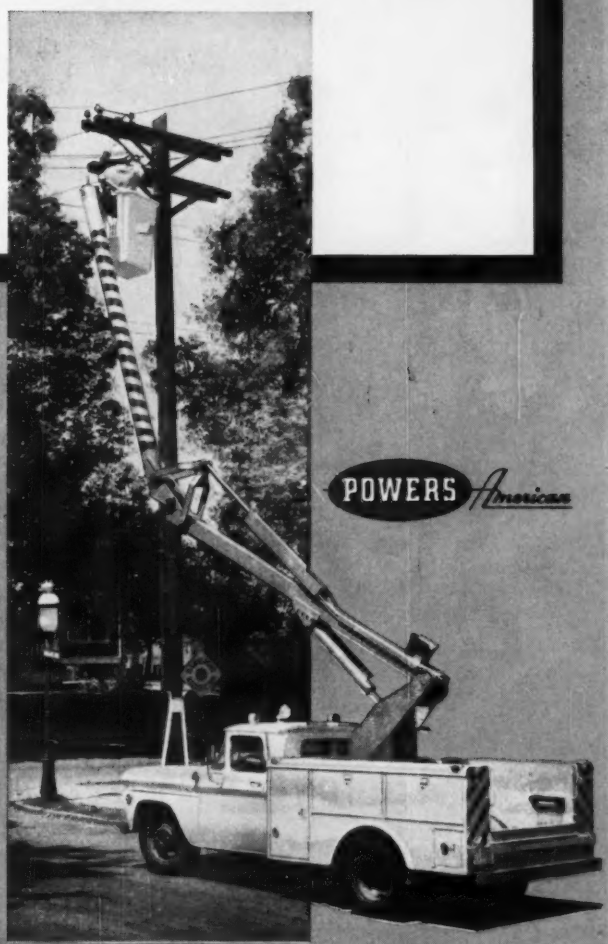
Now, crewmen can safely work between telephone and power lines, around private property or over parked and moving cars.

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- Insulated Spirex* outer beam and molded fiberglass basket provide protection from "hot" lines, and complete isolation for the workman in the basket.
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*Filament wound, resin-bonded, non-conductive fiberglass

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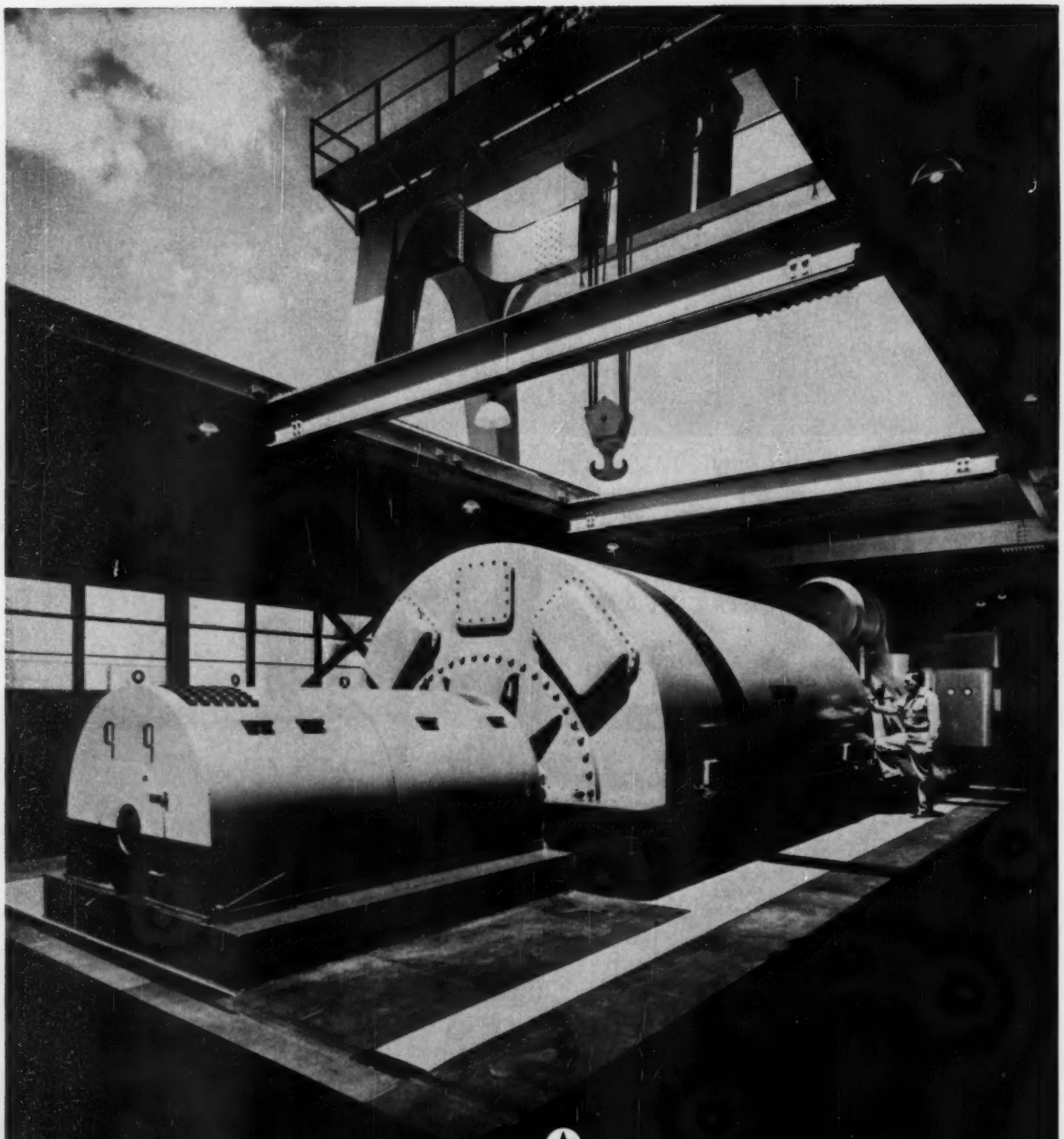

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The configuration of semi-outdoor installations typifies the economics of design incorporated in Stearns-Roger built steam power plants. From 75 years of service to industry, Stearns-Roger provides complete engineering and construction of efficient power facilities. Your power plant is our business.

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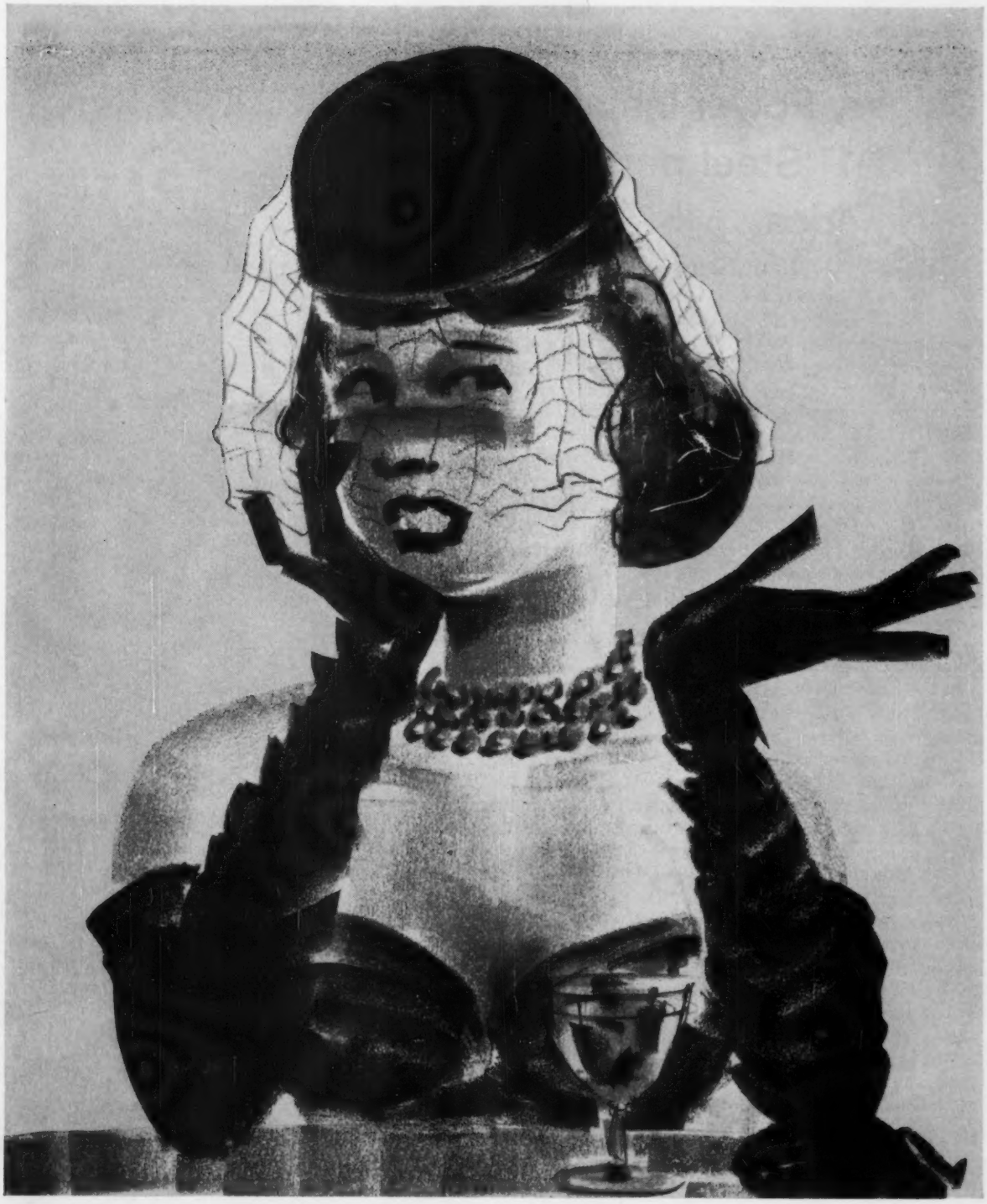
"The relative disposition of parts" —Webster



**"Of *course* you know L-M has announced Duralem!**

**It lasts longer, and, my dear, it's *SO* much *safer!*"**

538

# Calgary Power installs first (USS) "T-1" Steel penstock in America

Near Chinaman's Peak in the Canadian Rockies, Calgary Power, Ltd., has completed the first penstock in this hemisphere built with USS "T-1" Steel. The 1,601-foot-long, 8′ diameter penstock is part of their "Spray No. 2 Project" to produce more hydroelectric power for the Calgary Power System in Alberta, Canada.

Montreal Engineering Co., Ltd., who recognized the value of USS "T-1" Steel as an excellent constructional alloy steel for such applications as high head penstocks several years ago, proposed its use when the design work for Calgary's "Spray No. 2 Project" was started.

Montreal Engineering Company's engineers specified USS "T-1" Steel for this penstock because the steel's minimum yield strength of 100,000 psi made possible nearly a 50% savings in the amount of steel required. This saving helped to reduce substantially the transportation and erection costs that would have been required had structural carbon steel been used in this mountainous location.

In the new Calgary penstock, 500 tons of USS "T-1" Steel plate 5/16″ to 3/4″ thick were used by Dominion Bridge to fabricate the segments, or "cans" in its Calgary plant. These segments are 8′ to 7′ in diameter.

It was significant that the penstock was designed to a 37,000 psi unit working stress (or approximately 41,000 psi unit stress at 90% joint efficiency). This is more than 28% greater than the ASME code case 1204-4 allows for pressure vessels fabricated of "T-1" Steel in the United States.

The upper exposed length of the USS "T-1" Steel penstock will come down the mountain at various slope angles with a maximum of 50 degrees for 1,400 feet above the tunnel and approximately 50 degrees in the 220-foot-long tunnel at the bottom. The water will have a head of 905 feet and will drive a turbine to produce 50,000 KW of electric power.

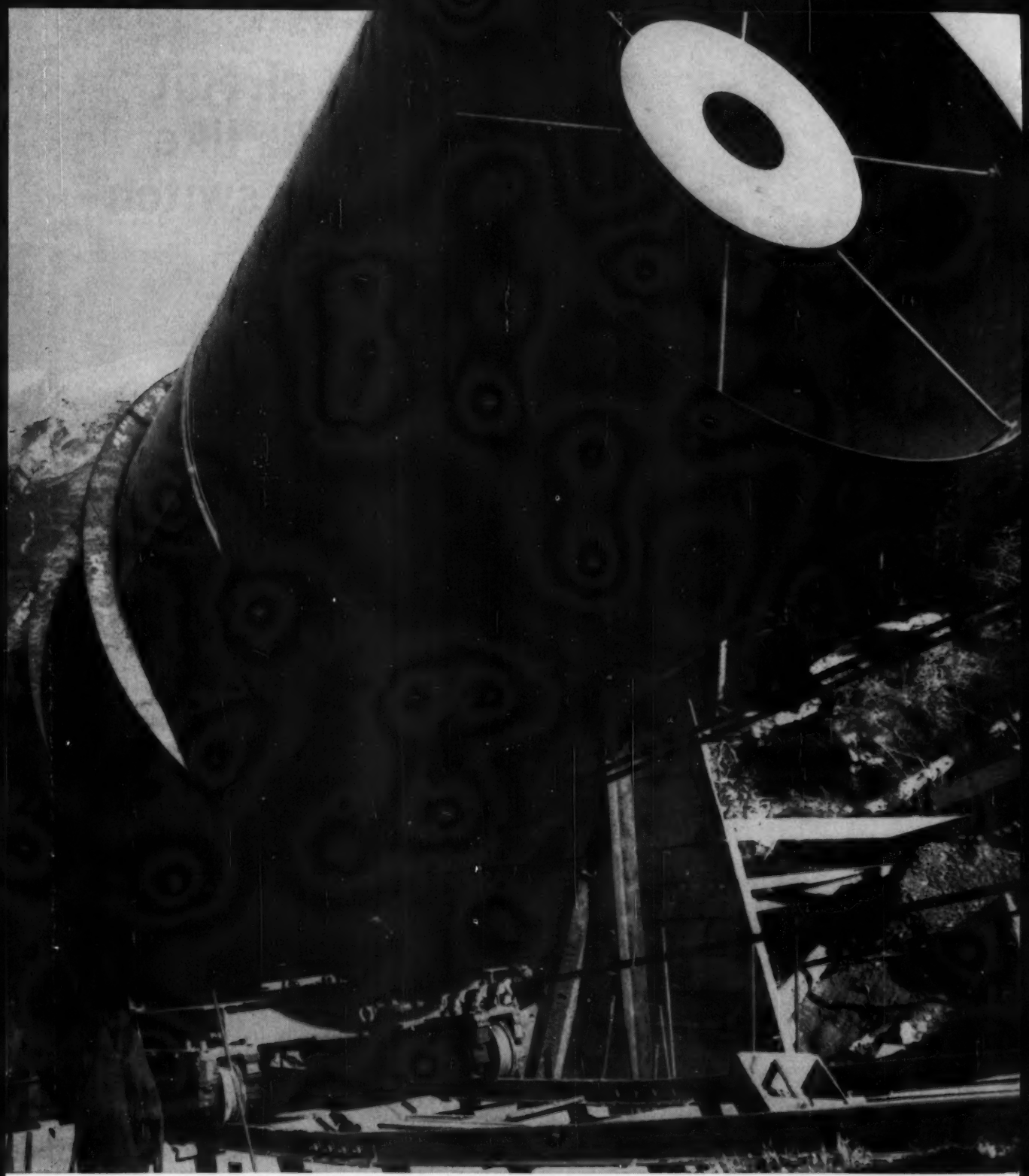
USS "T-1" Steel was selected for its exceptional strength and toughness, even at very low temperatures, and its ready weldability. What's more, it eliminates the cost of stress relieving.

For more information about USS "T-1" Steel, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

*USS and "T-1" are registered trademarks*

Whiteman's Pond, start of the penstock for the Calgary Power Spray Project.

This mark tells you a product is made of modern, dependable Steel.



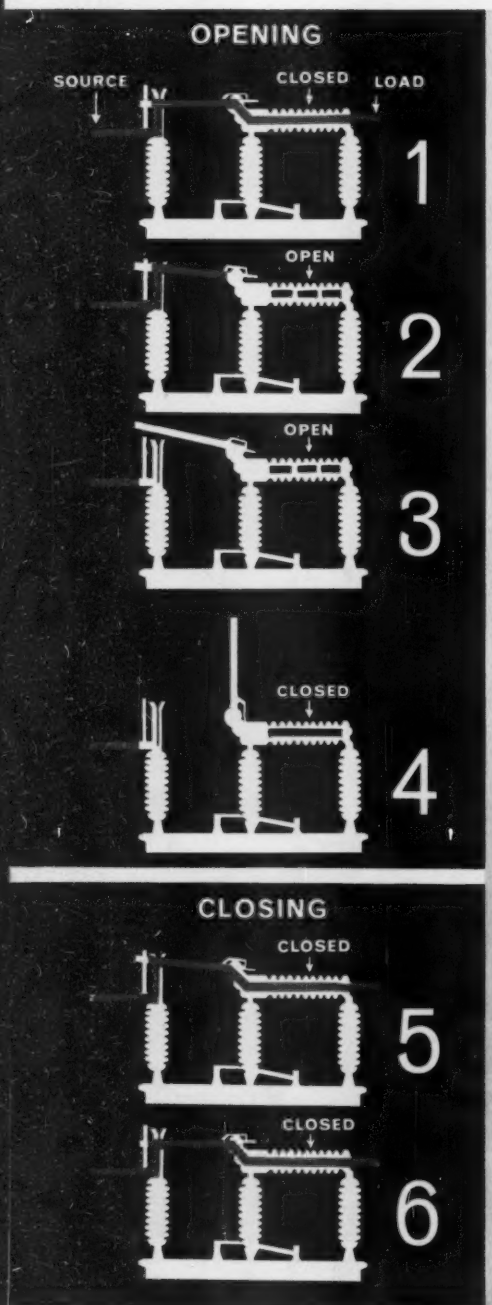
Above-ground penstock section of USS "T-1" Steel winds downward from Whiteman's Pond through the wild grandeur of the Canadian Rockies.

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
National Tube—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

**United States Steel**

USS

# Works like a circuit breaker—looks like an interrupter switch




## This is Circuit-Switcher. Costs less than a circuit breaker. Outperforms an interrupter switch.

Circuit-Switcher is the generic name for a new family of switchgear for handling a number of circuit interrupting duties on transmission systems. It's a cross between an interrupter switch and a circuit breaker. A significant feature of Circuit-Switcher is that it is mechanically programmed to fit high-voltage switching environments, whether breaking or making the circuit.

### PROGRAMMED CIRCUIT BREAKING

1. When Circuit-Switcher is in the closed position, the interrupting section carries the continuous current and withstands short-time surges—like a breaker.
2. As Circuit-Switcher starts to open, the "brain" mechanism (with its built-in sequence control and stored energy) trips the interrupting section, opening the circuit—like a breaker.
3. Now the "brain" moves the disconnect blade toward the open position to establish a visible air gap—like an interrupter switch. But unlike an interrupter switch, the blade is not burdened with shunting, actuating, and driving an interrupting unit.
4. As the disconnect blade approaches the fully open position, the "brain" recloses and recocks the interrupting section, unlike the interrupter switch which must recock at the most adverse loading point in its closing cycle.

### PROGRAMMED CIRCUIT MAKING

5. As "brain" closes the blade, inrush current (or fault current) is picked up at the jaw . . . not in interrupting section. Unlike the interrupter switch, the blade closes at high speed, unimpeded by having to reclose and recock an interrupting unit.
6. Circuit-Switcher is completely closed—ready for the next opening cycle.

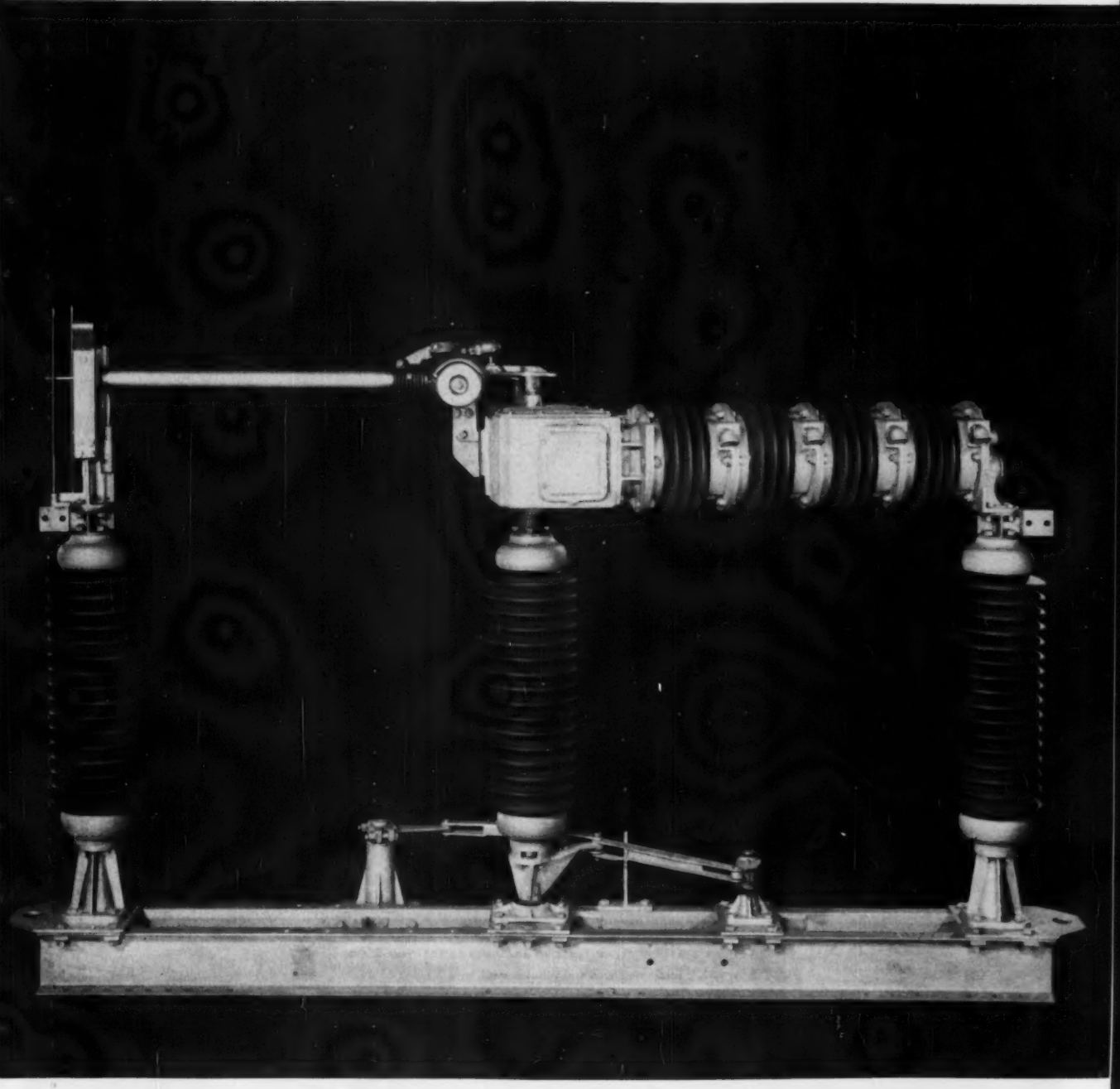
### With the guts to do the job

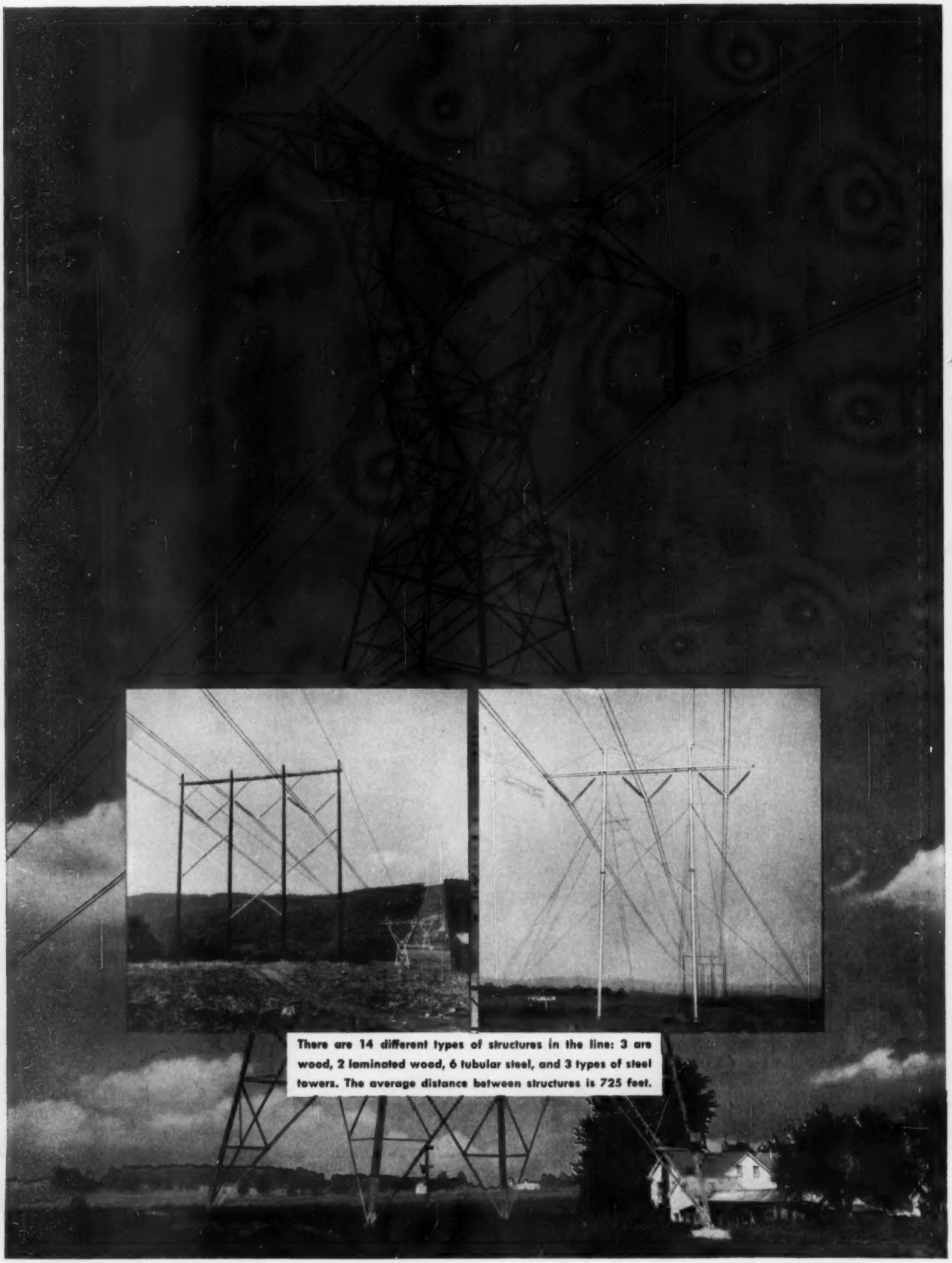
Like a circuit breaker, Circuit-Switcher's vital close and trip mechanisms are fully enclosed and protected. Unlike an interrupter switch, there is no gingerbread—no external shunts, triggers, cams, and levers—to freeze up, burn up, jam up, or goof up.

### Operation is "Goof-Proof"

The correlation of interrupting section action, disconnect blade action, and operating handle action is pre-scheduled by the "brain" mechanism. Any operating procedure—such as reversing direction in "midstream"—will not result in improper sequencing of interrupting section and disconnect blade.

**S&C ELECTRIC COMPANY**
4421 Ravenswood Ave. • Chicago 40, Illinois
Specialists in High Voltage Circuit Interruption since 1911





There are 14 different types of structures in the line: 3 are wood, 2 laminated wood, 6 tubular steel, and 3 types of steel towers. The average distance between structures is 725 feet.

# AMERICA'S "BIG-VOLT" LINE protected by ALUMOWELD OVERHEAD GROUND WIRE

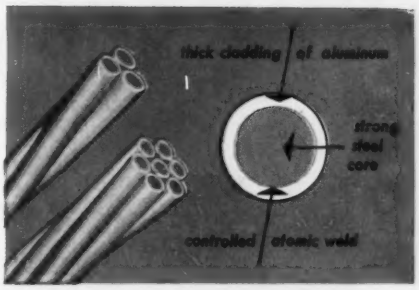
Like the famed "Big Inch" in the oil industry, Pennsylvania Electric Company's "Big Volt," its new 460-KV transmission line, represents a bold step forward in supplying the growing energy needs of America.

To protect the highest voltage operational line in America from lightning and transient currents, Penelec is using Alumoweld Overhead Ground Wire. This dependable, low-cost shield wire has three times the electrical conductance of steel, is just as strong and weighs 18% less. It has the same long life as solid aluminum.

Alumoweld is the result of the first successful cladding of a *thick* layer of pure aluminum over a high-strength steel core. The concentric aluminum covering comprises 25% of the cross-sectional area of each wire. Its high strength-to-weight ratio—higher than any other overhead ground wire—permits stringing with greater mid-span clearance to provide maximum lightning protection. Alumoweld's excellent conductivity assures reliable operation of protective relays and effectively discharges transient currents to ground.

Order Alumoweld Overhead Ground Wire and get Low-Cost, Long-Life Protection for your transmission lines.

*For more complete Alumoweld data send for Engineering Bulletin E.D. 3000.*




**A seven-strand Alumoweld Overhead Ground Wire (7 No. 6 Awg wires), approximately ½-inch in diameter with a breaking strength of over 22,700 pounds, is used to protect the highest voltage transmission line in America.**

ALUMOWELD®

**COPPERWELD STEEL COMPANY**

**WIRE AND CABLE DIVISION Glassport, Pa.**

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*A Feature Of The Moloney Metal-Clad Breaker Element . . .*

**EXCLUSIVE MOLONEY CONTACT DESIGN PRODUCES "BLOW-ON" ON BOTH MAIN AND ARCING CONTACTS, REDUCES EROSION . . . PROVIDES MAXIMUM CONTACT LIFE . . . MINIMIZES MAINTENANCE COSTS!**

The contact design on Moloney 5 and 15 KV Metal-Clad Breaker elements is another example of the functional engineering inherent in Moloney Breakers. The exclusive contact design of the Moloney Breaker utilizes electromagnetic "blow-on" on both the arcing and main contacts. Arcing contact "blow-on" is obtained through the geometry of design. Main contact "blow-on" is achieved by a strip of insulation in the slotted block between the

# EXCLUSIVE MOLONEY CONTACT DESIGN

hollow primary conductor and stationary main contacts which forces the current to flow in a loop. This creates an electromagnetic force producing a constant, solid, main contact pressure. As a result of these electromagnetic forces, contact erosion is substantially reduced and maintenance costs are minimized.

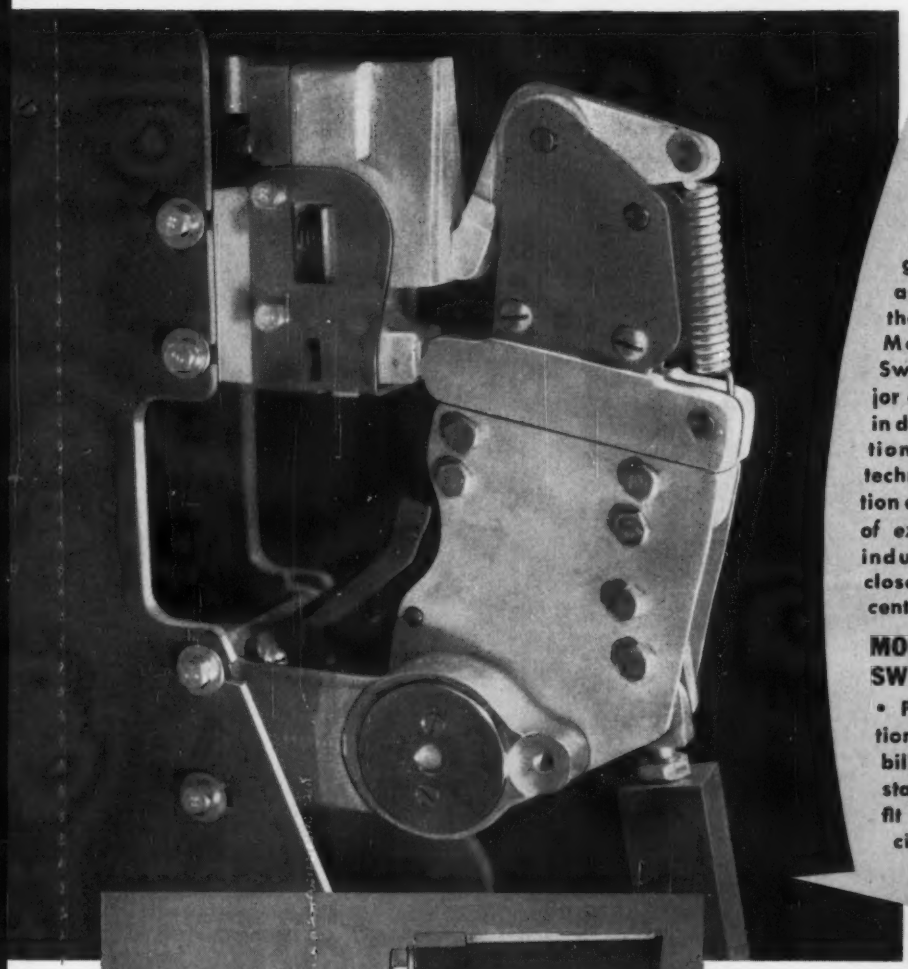
## *Features of Moloney Contact Design*

- Exclusive "Blow-on" On Both Main And Arcing Contacts
- Modular Construction Throughout Range Of Ratings
- Optimum Material Utilization And Fabrication Techniques Of Contact Components

ME61-25

*Switchgear Division* **MOLONEY ELECTRIC COMPANY**

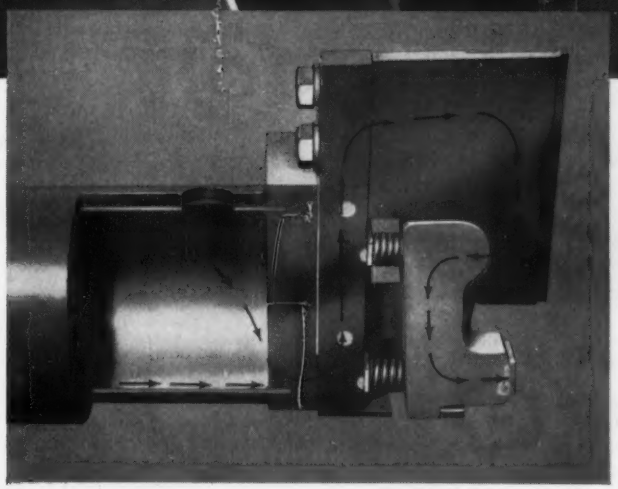
MANUFACTURERS OF TRANSFORMERS AND SWITCHGEAR FOR UTILITIES, INDUSTRY.

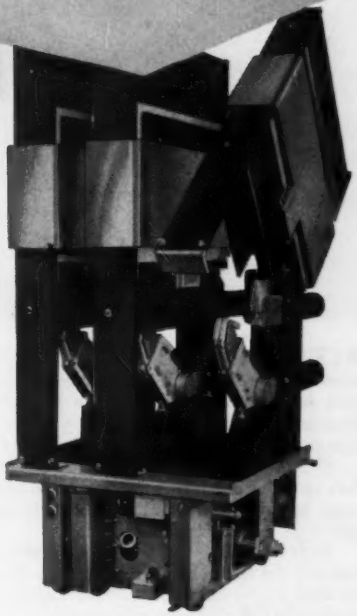


Development of exclusive, high performance components contributes to Moloney Metal-Clad Switchgear's outstanding performance. Designed to meet the needs of the industry, Moloney Metal-Clad Switchgear represents major creative break-throughs in design, material application and manufacturing techniques . . . a continuation of the Moloney *"tradition of excellence"* the electrical industry has known for close to three quarters of a century.

**MOLONEY METAL-CLAD SWITCHGEAR**

• Positive System Protection • Greater Dependability and Safety • Substantial Economic Benefit From Unique and Efficient Use of Materials.





Cutaway photograph illustrates Moloney principle of exclusive main contact "blow-on". Current is directed in loop by strip of insulation. The resulting electromagnetic force provides positive pressure on main contacts and increases contact longevity.

METAL M CLAD

MOLONEY ELECTRIC SWITCHGEAR DIVISION

**SAINT LOUIS 20, MISSOURI**

AND ELECTRONIC APPLICATIONS • SALES OFFICES IN ALL PRINCIPAL CITIES

**BITE**... that's what CRESCENT and CRESTOLOY pliers have! They've got the bite it takes to tackle every big and little job around the shop, on the ground, or up the pole. There's a toughness about these pliers that sets them apart from ordinary pliers...a toughness that's built-in at the factory.

CRESTOLOY pliers are forged from special steel alloy. They're electronically hardened for lasting strength. Precision-fitted box joints assure perfect jaw alignment and smooth operation under long, hard usage.

Every CRESTOLOY plier is factory tested for ease of cutting, correct tempering, and strength. A tag on each plier testifies that it has been individually tested, and meets or exceeds CRESCENT'S rigid specifications.

Perfect balance and broader handles make them easier to use. And their appearance is in keeping with their superb performance... handsomely finished with polished heads and gun metal handles.

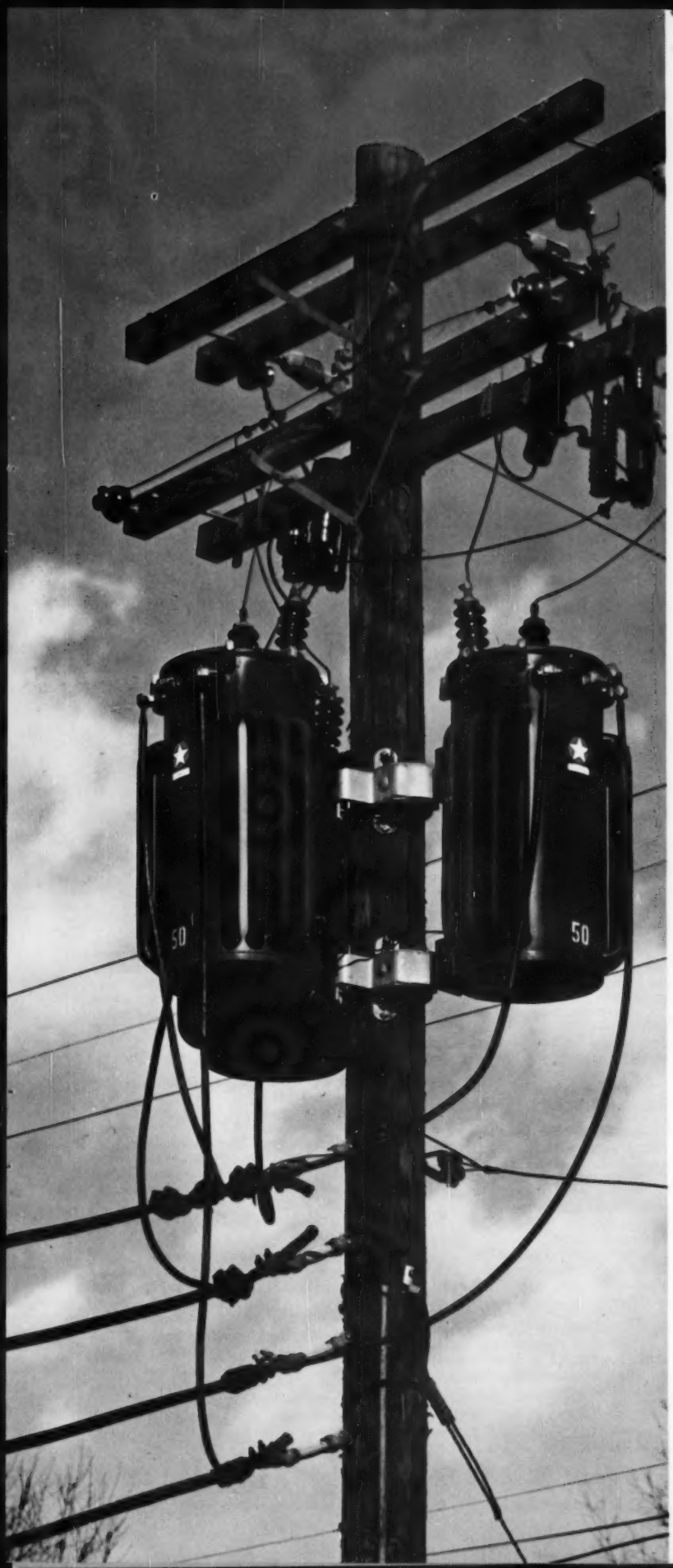
CRESCENT makes one of the world's most complete lines of pliers, under the trade names CRESCENT and CRESTOLOY. You'll find one for any job in a variety of patterns and sizes. All have the perfection of design and workmanship that have made CRESCENT tools the symbol of craftsmanship for over half a century. Next time you buy tools, buy the best.... buy CRESCENT.

*Sign of the Artisan Symbol of Excellence*

**CRESCENT TOOLS**
*Give Wings to Work*

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

**CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK**



# What year were these POLE STAR® TRANSFORMERS manufactured?

1957
1958
1959
1960
1961

Without checking serial numbers of the transformers, the answer to that question would not be easy, even for Pennsylvania Transformer personnel. The reason: a long-standing policy of CONSTANT PRODUCT IMPROVEMENT for Pole Star Distribution Transformers.

CONSTANT PRODUCT IMPROVEMENT means that refinements and innovations are introduced as soon as practicable after they have been thoroughly tested and approved. Pole Star users do not have to await periodic new models before benefiting from Pennsylvania's year-around research and development program, and from the constant search for new and better production methods.

Thus, although the appearance of Pole Star Transformers has not been drastically altered the past few years, dozens of changes were introduced during that period— including such things as:

- V.I.P. Finish, which doubled tank protection
- "Echelon" lap-on-top core, which provided lower-than-ever exciting current and other electrical improvements
- Refinements in an insulation system that is one of the most effective in use today
- Sky-blue Covers to protect against animal-caused outages
- Series-multiple switch, an optional feature
- Elimination of external bushing clamps

CONSTANT PRODUCT IMPROVEMENT is a major reason why purchasers of Pole Star Transformers are assured of the highest available quality—and outstanding operating efficiency—year after year. What this policy means *today* is shown on the reverse side.

*The transformers pictured were made in 1959.*

**PENNSYLVANIA TRANSFORMER DIVISION** McGRAW-EDISON COMPANY
CANONSBURG, PENNSYLVANIA

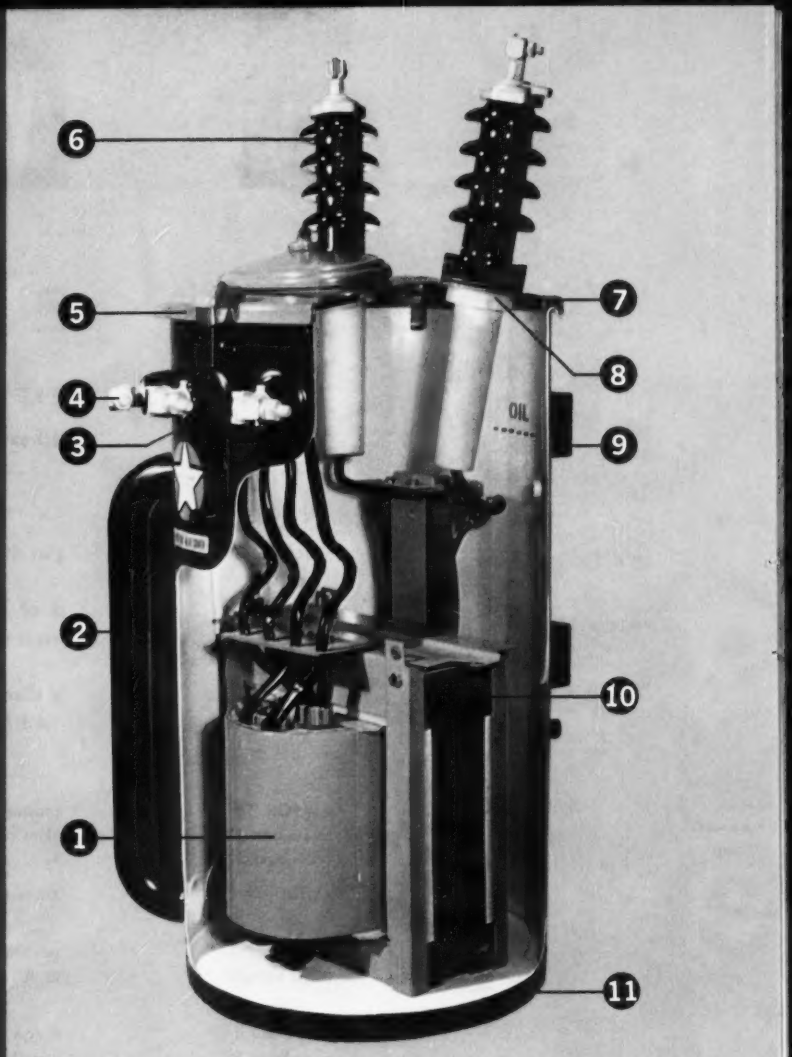
McGRAW EDISON

POLE STAR

*Turn page for facts about features*

# POLE STAR® DISTRIBUTION TRANSFORMERS

known for reliability and getting better all the time... as a result of Pennsylvania's policy of CONSTANT PRODUCT IMPROVEMENT




**1. High-strength insulation system**
Since its introduction several years ago, the highly effective Pole Star insulation system has been periodically upgraded as suppliers were able to meet higher specifications. As a result, Pole Star Transformers provide overload guarantees equal to or better than any being offered today—permitting continuous operation at 65°C rise.

**2. Double-sealed cooling tubes**
Cooling tubes—made in Pennsylvania's own plant—are expanded tightly against the tank wall, then are welded inside the tank, where there is ample room for a thorough job. Thus, tubes are given a double seal to protect against leakage and keep the transformer on the job.

**3. V.I.P. finish**
Five-step V.I.P. paint process *doubles* tank protection. It sets up extra-high primary resistance to moisture, alkali and acids . . . and also provides a secondary or insurance barrier that prevents the spread of corrosion if any bare metal becomes exposed, as in the case of accidental scratching.

**4. Double-keyed sidewall bushings**
Low-voltage sidewall bushings feature a double-keyed construction that prevents bushings from rotating in whole or in part when line connections are made.

**5. 'Sky-blue' cover**
To prevent animal-caused outages and protect wildlife, insulated cover is standard on all units with cover bushings. Sky-blue color facilitates identification in storage, on poles.

**6. Pressure-tested bushings**
All bushings are pressure-tested after being assembled, to check both porcelain and connector seal.

**7. Nitrile rubber gaskets**
All gasket seals—at bushings, cover, handhole—are made with nitrile rubber properly compressed for maximum gasketing efficiency. Nitrile rubber is highly resistant to oil, heat, cold, moisture, dust, and other atmospheric conditions.

**8. Internal bushing clamps**
Absence of external clamps eliminates potential dirt catchers and sources of corrosion. Internal clamps are ring-type to assure uniform pressure.

**9. Hand-welded hanger brackets**
Hanger brackets are hand-welded completely around the bracket flange. No crevices are left that might remain unpainted and where rust-producing moisture can collect. Result: the transformer is on the pole to *stay*.

**10. Echelon lap-on-top core**
Noted for outstanding electrical characteristics since 1947, the patented lap-on-top core provides new highs in efficiency as a result of its new "echelon" look. One of but four basic oriented-steel distribution transformer cores being used today, the lap-on-top core is available *only* in Pole Star Transformers.

**11. Triple-layer base**
The tank side is rolled up over the tank-bottom flange, forming an extra-strong, triple-layer base. The joint is submerged arc welded completely around the tank to prevent any collection of moisture.

**Production-line impulse testing**
Among the first distribution transformers to be impulse tested on a production-line basis, Pole Star Transformers are tested *without arresters*. The apparatus used is so sensitive it will detect even single-turn faults.

**PENNSYLVANIA TRANSFORMER DIVISION**
McGraw-Edison Company • Canonsburg, Pennsylvania • Greater Pittsburgh District

*See other side for more about CONSTANT PRODUCT IMPROVEMENT*

Electrical World

OCTOBER 23, 1961
Vol. 156, No. 17

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EXPERIENCE WITH BREED AND SPORN PLANTS aids Tanners Creek 600-Mw design.

# The Electrical Week

**LATE NEWS ▶** **As Electrical World went to press,** the board of directors of AIEE, meeting in Detroit, was preparing to vote on a resolution endorsing and setting up procedures for a consolidation of AIEE with IRE. The resolution sets up a 4-man committee composed of past presidents and directors to study feasibility, practicality and form of the consolidation preparatory to submitting it to a vote of the membership. The board of directors of IRE (Wed.) passed a similar resolution endorsing the consolidation "provided legal and operating problems can be resolved."

**Soviet Premier Nikita Khrushchev** tells Communist Party Congress output of power in Soviet Union will reach "more than 520 billion kwhr" in 1965. Original goal was 500 to 520 billion. Observers regard this as a rather modest claim of overfulfillment, considering that other sectors of economy are well above quotas.

**A Federal Power Commission study of major utility interconnections** is already in the formative stages. New FPC Chairman Joseph Swidler tells *Electrical World* that some such study would be needed to make sure that major interconnections—such as have been proposed in the recent Edison Electric Institute announcement—are carried out "in the national interest."

**Negotiations between Southwest Power Pool and Tennessee Valley Authority** for proposed exchange of peaking power (EW, Sept. 4, p 34) are encouraging; further studies are being made and future meetings are planned.

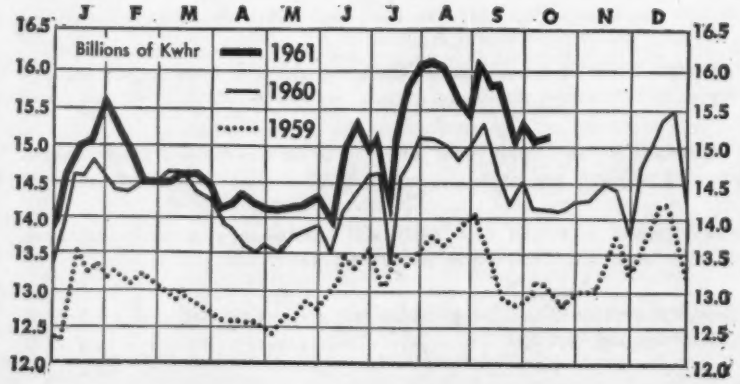
**Jersey Central Power & Light Co is examining possibilities** of building a 400-Mw nuclear power plant at Oyster Creek, N.J. The company's original plans for a fossil fuel-fired plant on the site are still under consideration, however, and company officials emphasize that several means of meeting system growth, including additional interconnections, are being studied.

**Interior Secretary Stewart Udall,** speaking at ground-breaking ceremonies at site of $100 million federal Yellowtail Dam in Montana, reiterates that Kennedy Administration is not proposing a valley authority such as TVA for the West. He calls for cooperation by investor-owned companies with the federal government to make power capacity in Northwest more valuable and economical. But, in noting that it had taken nearly half a century to get the dam under construction, he blames, at least in part, "shortsighted private interests."

**General Electric Co announces that it will not reduce prices** on 37½ and 75-kva transformers, as some other companies have done (see p 24).

## WEEKLY POWER OUTPUT—Up 7.1%

(Week ending Oct. 14), Kwhr 15,125,000,000




Per Cent Change From Previous Year

| | Sept. 30 | Oct. 7 | Oct. 14 |
|---|---|---|---|
| Total U.S. .... | + 8.3 | + 6.6 | + 7.1 |
| New Eng. ..... | + 9.1 | + 9.5 | +10.3 |
| Mid. Atlan. ... | + 6.6 | + 7.9 | + 8.6 |
| Cent. Indust. .. | + 5.2 | + 5.0 | + 6.4 |
| West. Cent..... | + 7.2 | + 7.6 | + 7.8 |
| Southeast ..... | +10.7 | + 8.0 | + 4.3 |
| South Cent.... | +19.3 | + 0.2 | + 7.5 |
| Rocky Mount... | + 2.2 | + 4.3 | + 8.8 |
| Pacific | | | |
| NW ..... | + 5.8 | + 7.2 | + 5.8 |
| SW ..... | + 7.9 | +10.2 | +11.6 |

Seasonally Adjusted Index 297

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Source: Edison Electric Institute

# Supply Lines

## CANADIAN MANUFACTURERS WANT ANTITRUST CHANGES

**When Canadian electrical manufacturers held their annual CEMA meeting recently,** it was quite clear, from their reaction to a talk by Dr D. E. Armstrong, director of McGill University's School of Commerce, that they agreed it is time for a change in Canada's combines laws, which are, in effect, similar to antitrust laws in the US. CEMA's new president, Thomas Edmondson, president of Ferranti-Packard Electric Ltd, says he will work for a change in antitrust attitudes.

**Armstrong's primary axiom** is that in an oligopoly, there will "inevitably (be) some explicit or implicit understanding among the firms about how prices will be determined" because a competitor sets his price only after taking into account the probable reaction of his competitors. The acceptance of this interdependency is what leads to the inevitable agreements. "Anti-combines legislation," he then notes, "cannot hope to do more than make sure that agreements are implicit rather than explicit and that they therefore remain relatively fluid. In brief, it is the objective of anti-combines legislation to prevent economic arteriosclerosis."

**During prosperous times,** Armstrong believes, the laws work "reasonably well." Price competition takes place around "full costs," and in the long run the most efficient firms will be encouraged to expand, and the high cost firms will contract. "It is the job of the combines investigation officer in this kind of environment," he stresses, "to make sure that there is sufficient competition to squeeze out high cost firms." But during periods of stagnation, he says, the problem is quite different. If there is excess capacity and price warfare (at these times the only alternative to price agreements, he notes), "prices will inevitably fall to out-of-pocket costs . . . The firms that get eliminated by such a price war are not necessarily the most inefficient; they are more likely to be the small firms."

**This, then, is the problem of antitrust laws** to Armstrong, and on this he makes a couple of suggestions. During periods of stagnation he advocates implicit pricing arrangements which are usually a variation of price leadership. "The price leader should be the firm with the lowest cost and the most economic sophistication (because) only the firm which possesses economic know-how will reject the silly and short-sighted view that prices should be raised in response to a fall in demand . . . or to stationary demand even if capacity and therefore capital costs have increased. The price leader should also be quite ruthless in setting a price which puts pressure on the least efficient member of the industry. An industry which never sees a bankruptcy or forced merger is not a healthy industry and might well be brought to the attention of the Restrictive Trade Practices Commission."

**To the Commission,** he suggests that investigations of combines be implicitly (not explicitly) countercyclical. "A period of stagnation is not the appropriate time to be upsetting existing pricing understandings. The time to upset pricing arrangements which are becoming excessively explicit is during a period of rising demand. There is one exception to this rule: if during a period of falling demand and excess capacity an industry has nevertheless raised prices, then I believe the Commission would be well advised to jump in with both feet."

## PUBLIC UTILITIES BUYERS' GROUP MEETING SCHEDULED

**Annual conference** of the Public Utility Buyers' Group of the National Assn of Purchasing Agents is scheduled for Feb. 4-6, 1962, in San Francisco.

## TWO COMPANIES ANNOUNCE PRICE REDUCTIONS

**Price reductions,** effective Oct. 4, for 37.5 and 75-kva pole-type distribution transformers of all voltage classes and types have been announced by RT&E Corp. The 37.5 kva reductions range from 7.6% to 11.5%, and 75-kva units are reduced by as much as 8.7%. The company says the adjustments will make a uniform pattern of pricing throughout all transformer sizes.

**Roadway lighting equipment prices are lowered** as much as 15% by Westinghouse Electric Corp. Affecting almost all types of mercury-vapor and incandescent equipment, range of reductions is from 3% to 15%. Price lists revised are: 60-120, 60-320, 60-420, 60-720, and 62-720. Changes became effective Sept. 11, and all orders placed on or after that date will be computed at the new prices.

## VALUE ANALYSIS TECHNIQUES IN NEW MANUAL

**Latest techniques of value analysis** are carried in a new manual authored by Lawrence D. Miles, General Electric's value analysis chief, and sometimes called the "father" of the value analysis movement. McGraw-Hill Book Co is publisher. Title is "Techniques of Value Analysis and Engineering."

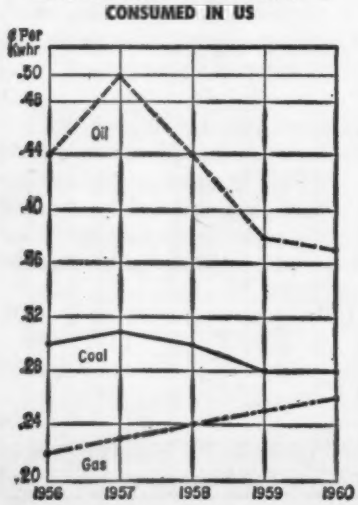
**A simple, three-step approach** to VA is recommended by Miles. He calls it "blast, create, and refine." The **"blasting"** stage knocks all preconceived ideas about the product out of the way and suggests simple ways to accomplish the basic functions involved, even if they don't seem practical.

**The "create" step** generates alternate ways to modify the blasting concepts to do the job at hand. At this stage the analyst equates cost with function—finds out how much must be paid to get a higher tolerance, etc.

**The "refine" step** combines alternates with necessary functions and comes up with the lowest cost combination.

**The VA specialist gets these words of caution:** "The value analysis will not do the buyer's job" and "The buyer must be kept advised."

**COST PER KWHR BY TYPE OF FUEL CONSUMED IN US**



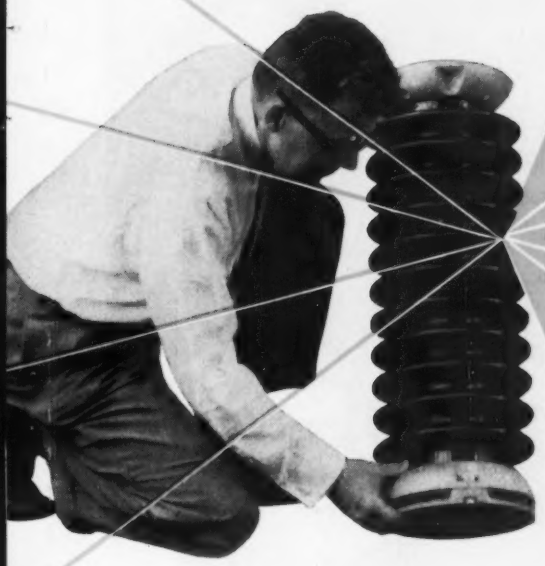

A NEW FUEL ANALYSIS published by Edison Electric Institute shows a slow rise in cost of fuel burned by electric utilities, and also shows price behavior of principal fuels. Analysis breaks down to geographic regions and states, also. It covers 95% of net fuel generation.

**ANALYSIS OF FUEL FOR ELECTRIC GENERATION BY THE ELECTRIC UTILITY INDUSTRY FUEL BURNED UNDER BOILERS AND BY INTERNAL COMBUSTION ENGINES**

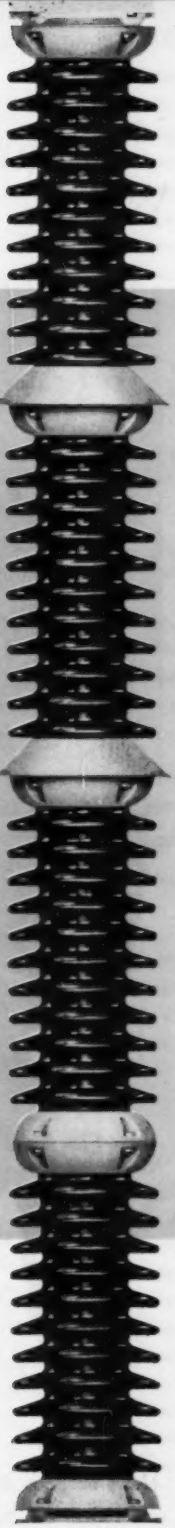
| Year | Average Btu Per Net Kwh | Average Cost per Million Btu Consumed ¢ | Average Cost of Fuel per Net Kwh ¢ | % Net Fuel Generation Reported | Average Cost per Million Btu Consumed — Cents | | |
|---|---|---|---|---|---|---|---|
| | | | | | Coal | Oil | Gas |
| 1960 | 10,701 | 26.2 | .28 | 95.2 | 26.0 | 34.3 | 24.4 |
| 1959 | 10,879 | 26.1 | .28 | 95.7 | 26.1 | 35.0 | 23.2 |
| 1958 | 11,090 | 26.8 | .30 | 96.0 | 27.2 | 39.2 | 21.5 |
| 1957 | 11,365 | 27.1 | .31 | 96.0 | 27.5 | 44.2 | 20.2 |
| 1956 | 11,456 | 25.4 | .29 | 95.6 | 26.1 | 38.3 | 18.9 |

SOURCE: EDISON ELECTRIC INSTITUTE

# Simplify your inventory



**Inter-changeable Unipost fits anywhere in stack, cuts inventory, avoids confusion**



10105-H

The new O-B station stacking Unipost has money-saving advantages:

- One unit fits all positions in the stack.
- Can cut inventory by 60%.
- Simplifies maintenance work; no confusing top, middle, and bottom units.
- Fits standard stack height and bolt circle of switchgear and steelwork.
- Broad base gives extra support and rigidity throughout stack.
- When two system voltages are used, often the same unit can be used to provide both BIL's.
- Uniposts start at 450-kv BIL and can be supplied in three strengths.

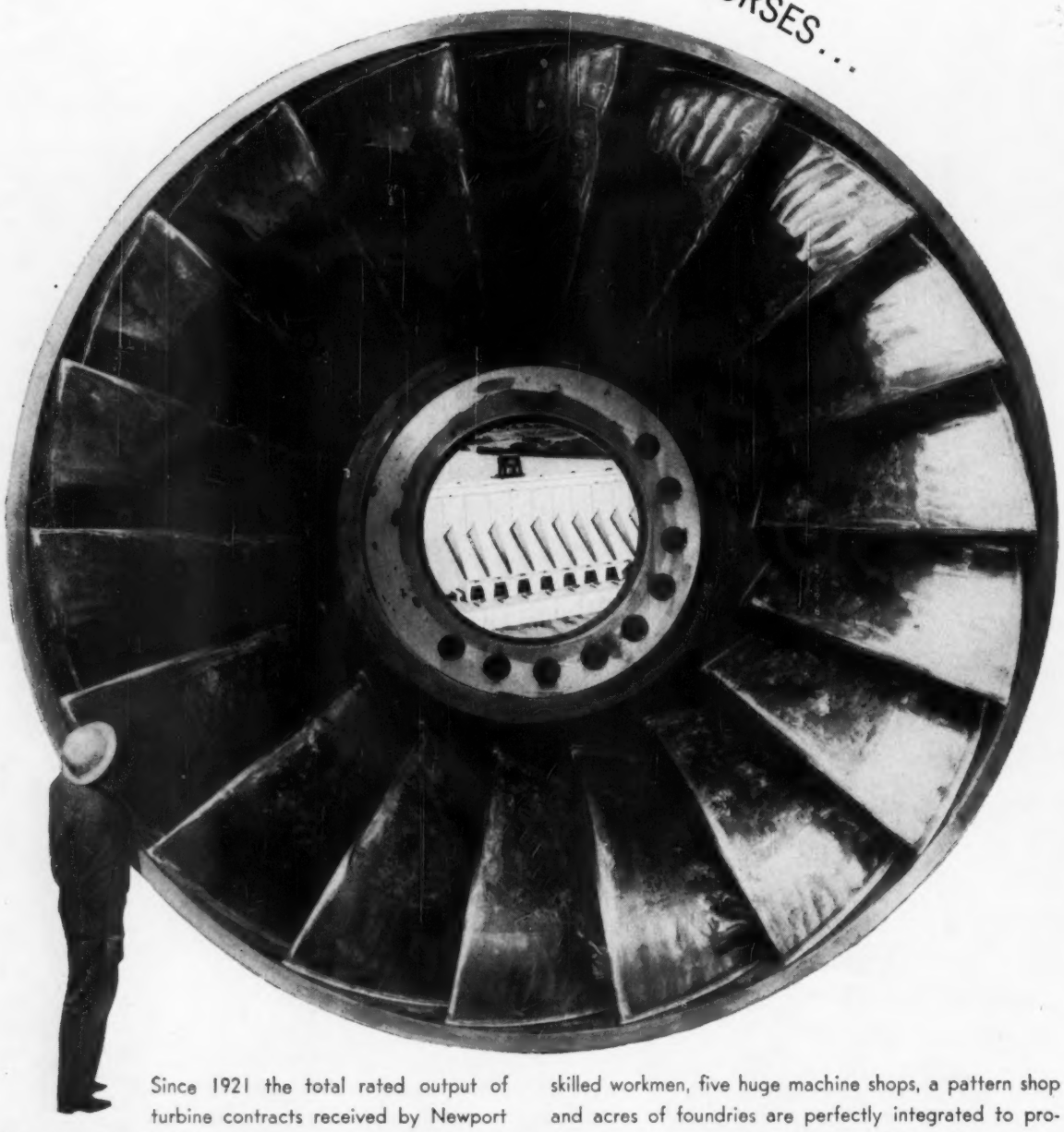
Investigate O-B Uniposts for all station insulation. Specify them on switchgear and for all other station uses.

**OHIO BRASS COMPANY, MANSFIELD, OHIO**
**Canadian Ohio Brass Co. Ltd., Niagara Falls, Ont.**

*Ohio Brass* HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

# NEWPORT NEWS HARNESSES 12,000,000 HORSES...



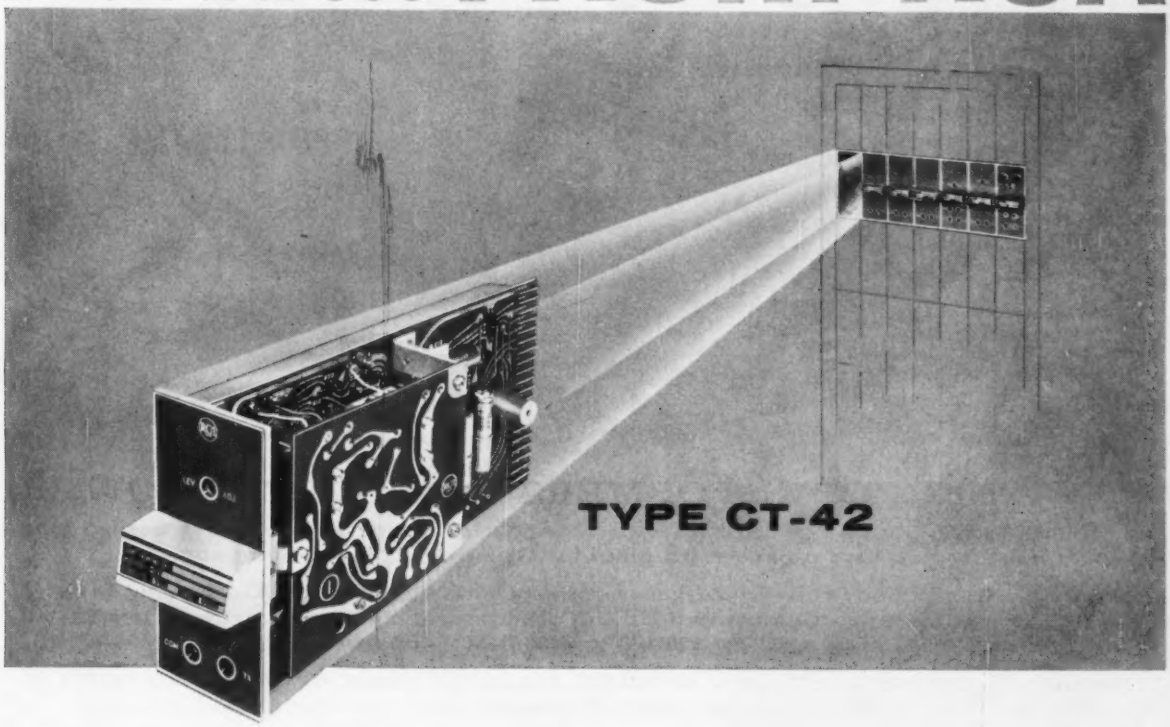
Since 1921 the total rated output of turbine contracts received by Newport News exceeds 12,000,000 horsepower. The Niagara Project, Grand Coulee, Hoover and Chief Joseph are but a few of the installations for which Newport News has designed and built such equipment as hydraulic turbines, valves, gates and penstocks.

Newport News has the men . . . the methods . . . and the machines to take gigantic jobs like these in stride. Large engineering and design staffs, hundreds of highly skilled workmen, five huge machine shops, a pattern shop and acres of foundries are perfectly integrated to produce large units in the shortest possible time . . . from water power equipment to wind tunnels, from cracking towers to paper dryer rolls.

Look to Newport News with its seventy-five years of metal fabricating experience. Your inquiries are invited.

**Newport News**
SHIPBUILDING AND DRY DOCK CO.
NEWPORT NEWS, VIRGINIA

# NEW... FROM RCA




## SOLID STATE TONE MULTIPLEX

### FOR WIRELINE, MICROWAVE OR CARRIER

**24 channels from 420 to 3180 cps—Spaced every 120 cycles (CCITT Standards)**
**18 channels from 4300 to 7600 cps—Spaced 170 to 220 cycles**

The CT-42 is an all new tone multiplex of high performance designed to operate over a wide environmental range. Ruggedly built, it uses computer grade components for lasting dependability.

Each channel can be frequency-shift or AM keyed for teletype, telemetering, control or data signals. Six transmitters or receivers in any combination may be plugged into a standard shelf which also contains a husky regulated power supply.

Channel units operate from 24 V DC or 117 V AC power supply.

If you are looking for the newest and best in tone multiplex equipment, mail the convenient coupon for complete specifications and prices.

The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

**RADIO CORPORATION OF AMERICA**
Microwave Equipment, Dept. AD-45
Building 15-5, Camden 2, N.J.

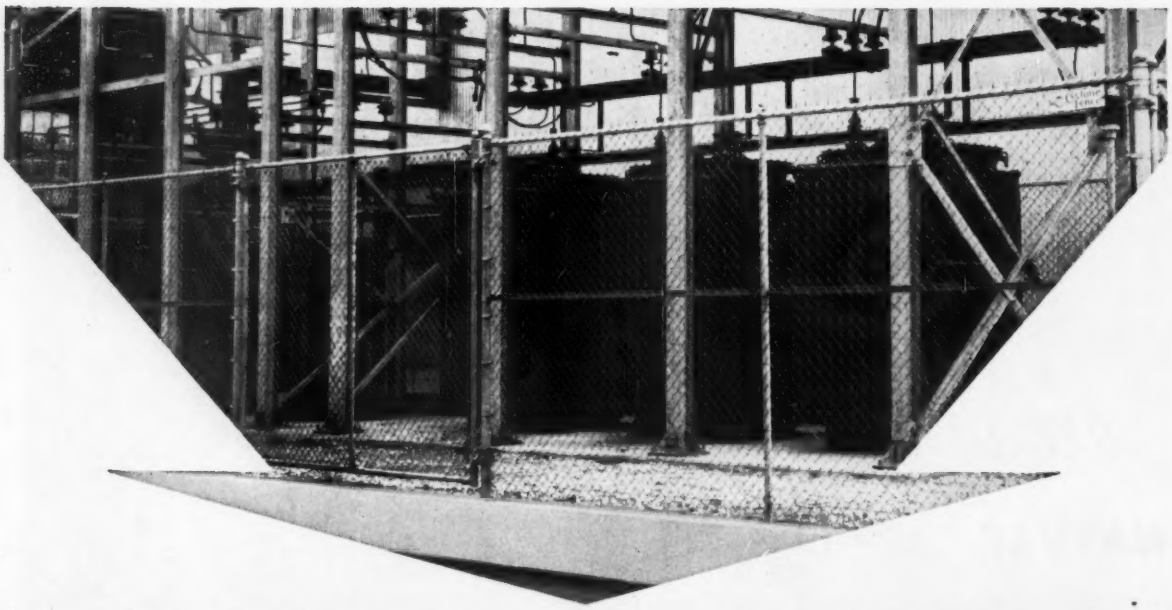
☐ Please send new catalog sheet and price list on Type CT-42 Tone Equipment.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____



## SIX WAGNER® TRANSFORMERS PROVIDE THE POWER

Here are six Wagner® transformers with a full-time job: providing all the power needed by a new electroplating line that produces tin plate for Granite City Steel Company.

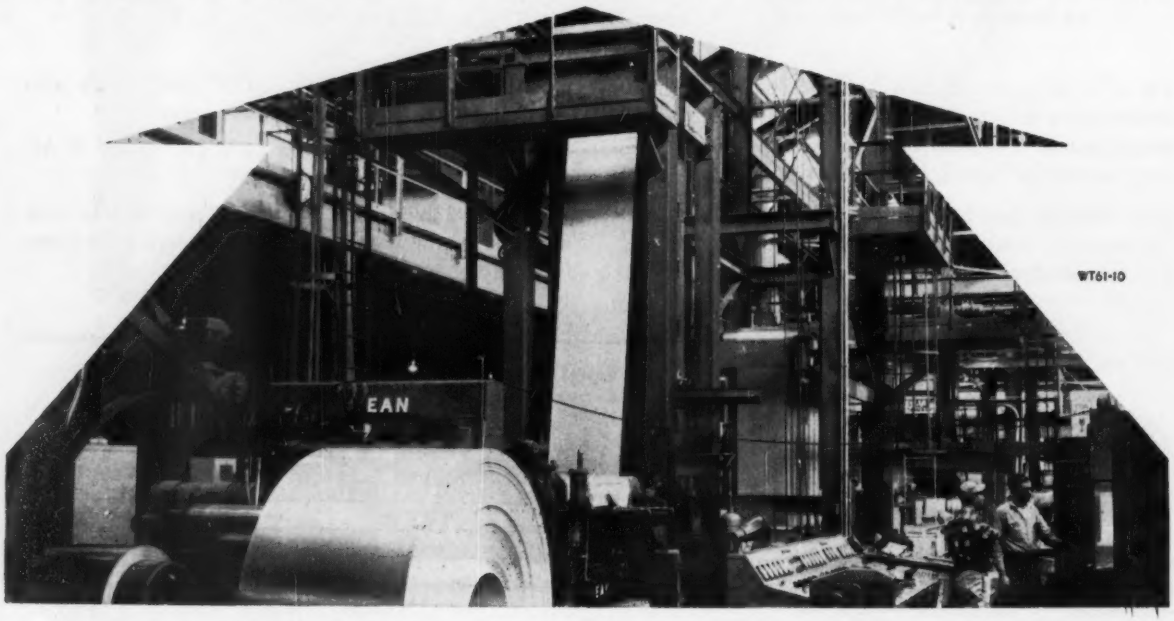
Three of the six supply power to motor-generator sets which convert to DC for variable speed drives, and to plating generation equipment and other major equipment drives. They are all 1667 kva, single phase, 60 cycles, 7200/12470Y to 2400/4160Y volts transformers.

The second set of three transformers are all 500 kva, single phase, 60 cycles, 7200/12470Y to 240 x 480 volts. They supply power for auxiliary pumps, etc.

All six are of the latest design . . . have wound cores of cold-rolled oriented grain steel. Their performance stability is outstanding. They're built to be trouble-free . . . built to provide all the power the plating line needs. Wagner transformers are designed to provide all the power you need, too. Your Wagner Sales Engineer can show you how. Call him. Soon.

**Wagner Electric Corporation**
6456 PLYMOUTH AVENUE, ST. LOUIS 33, MO., U.S.A.

## FOR GRANITE CITY STEEL'S NEW TIN PLATING LINE



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Sorensen high precision AC regulators hold 60 cycle line voltage to ±0.01% for use in standards laboratories, for meter calibration and for other applications demanding a voltage source of highest accuracy and stability. Natvar Isoglas, used to insulate transformer coils has excellent thermal stability up to 155°C continuous operating temperatures.

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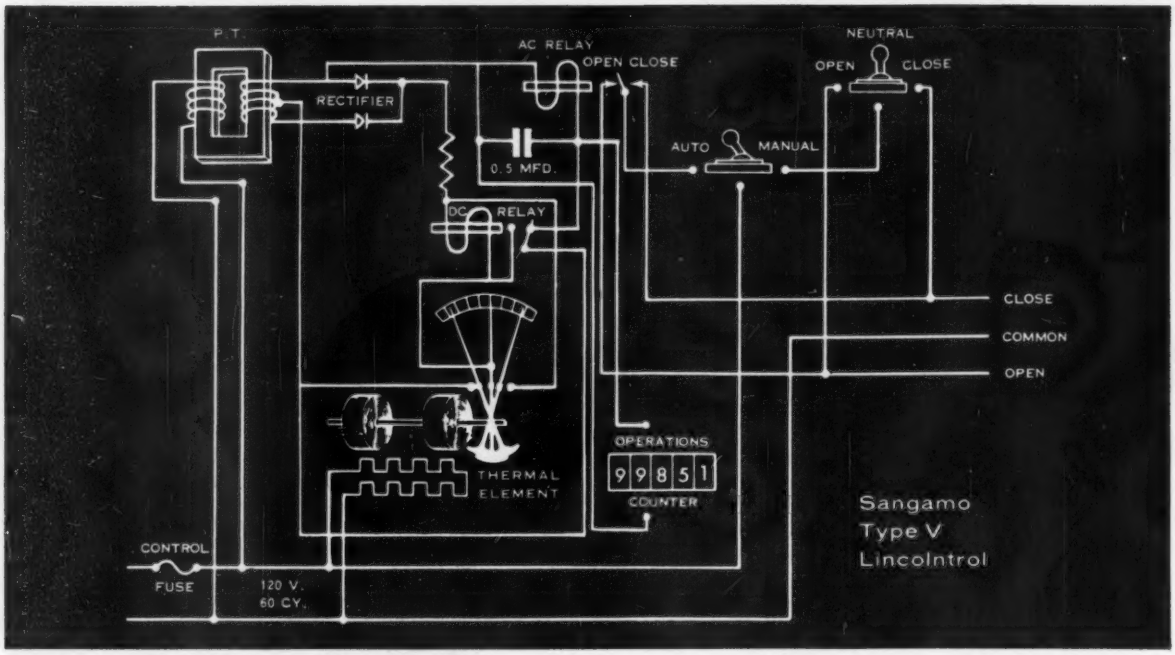
# GET BETTER CAPACITOR CONTROL WITH THERMAL METER SENSING

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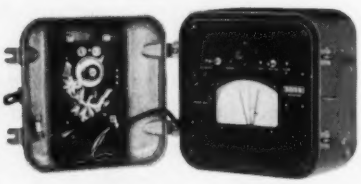
**THE SANGAMO LINCOLNTROL,** with its thermal meter signal relay element, inherent time-lag characteristic, and calibrated scale, is ideal for automatic switching based on an electrical quantity (volts, amps, watts, vars).



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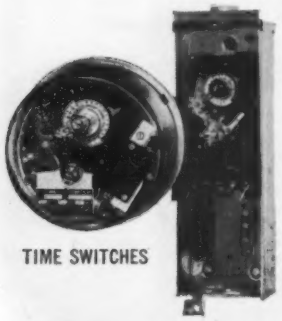
**SANGAMO COMBINATION CONTROLS** let you switch on the basis of time-temperature, voltage-time, voltage-current; any number of combinations for specific requirements.

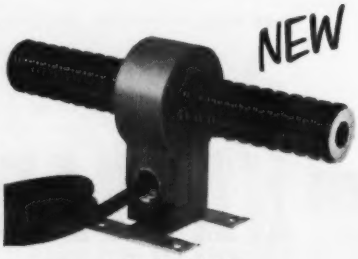


TIME SWITCHES

**SANGAMO TIME SWITCHES** provide automatic switching on predetermined time schedules. Synchronous carryover, omitting devices and other features make them extremely useful.

**NEW . . . HIGH VOLTAGE CT**

Great partner for your capacitor controls: the Sangamo V-150 High Voltage Current Transformer that combines 15 kv capabilities with low cost and 2% accuracy. Available with 200:5 and 100:5 ratios.




HIGH VOLTAGE CT

**SANGAMO ELECTRIC COMPANY**

SPRINGFIELD, ILLINOIS

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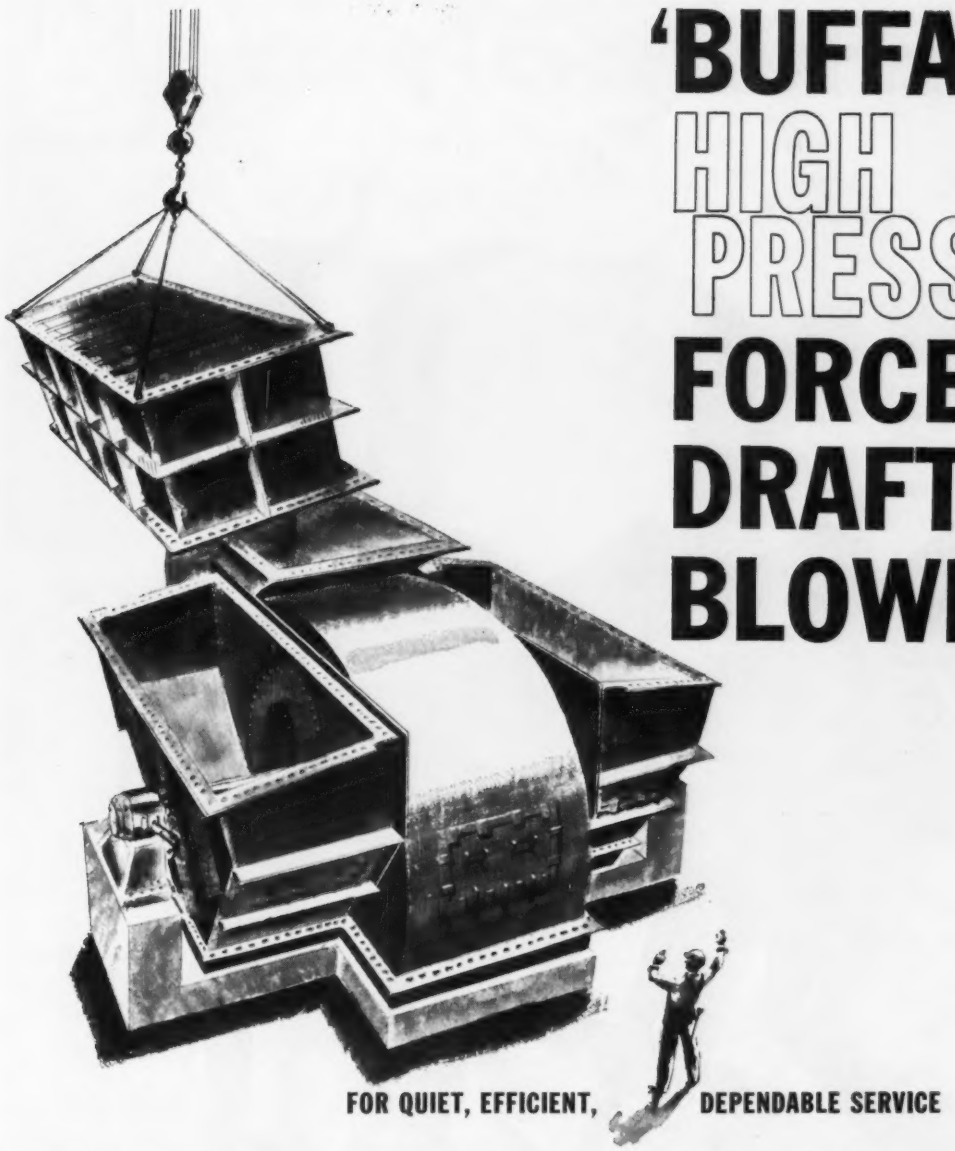

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**FOR QUIET, EFFICIENT, DEPENDABLE SERVICE**

'Buffalo' blowers are "tailor made" to move greater volumes of air at higher static pressures (to 80 inches WG and beyond) and lower brake horsepower without excessive noise.

Buffalo makes over seventeen different types of draft fans in more than fourteen sizes and in all possible arrangements. Each has a smoothly contoured housing designed to provide a uniform flow of air from inlet rotor to ductwork. Depending on operating conditions, either the air foil or backward curved blade design will be specified.

Sound and vibration are dampened by the solid construction of both housing and inlet boxes to assure longer-lasting, vibration-free service. And, where required, additional attenuation may be engineered into the system.

You'll find our engineering representatives, located in cities throughout the country, qualified to assist you in selecting and operating the proper blower for your job.

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AIR HANDLING DIVISION

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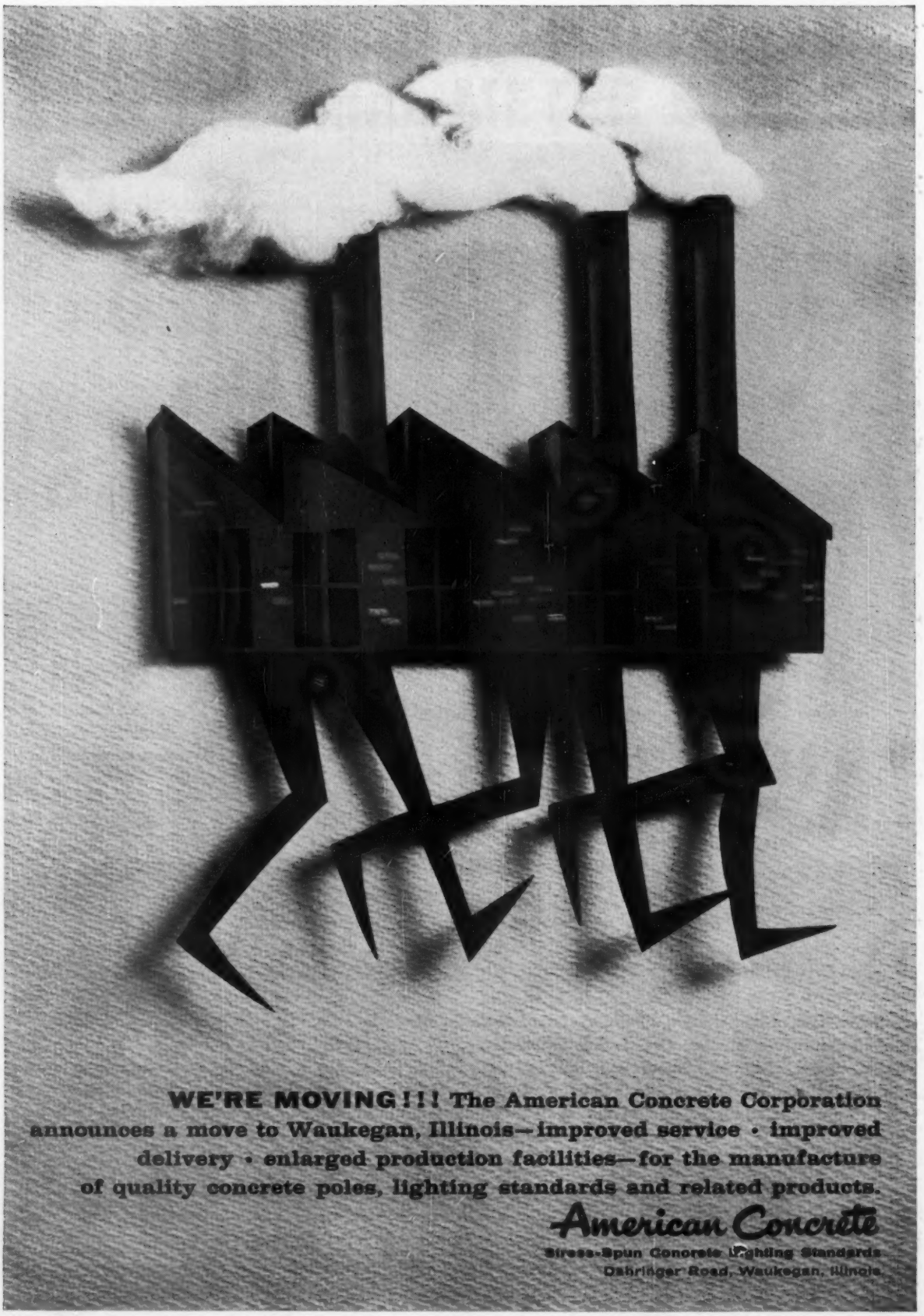
*'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.*

*'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.*

*'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.*

*Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.*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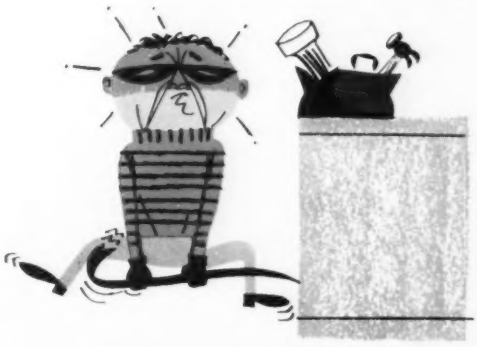
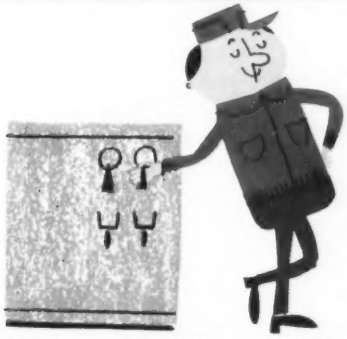
fits between sidewalk and street



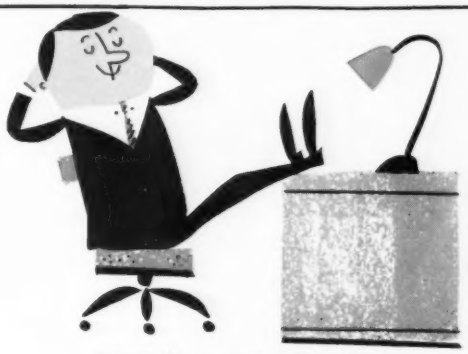
tamper-proof interlocked doors

removable cable compartment

painted "invisible" green



all handles and switches on LV side

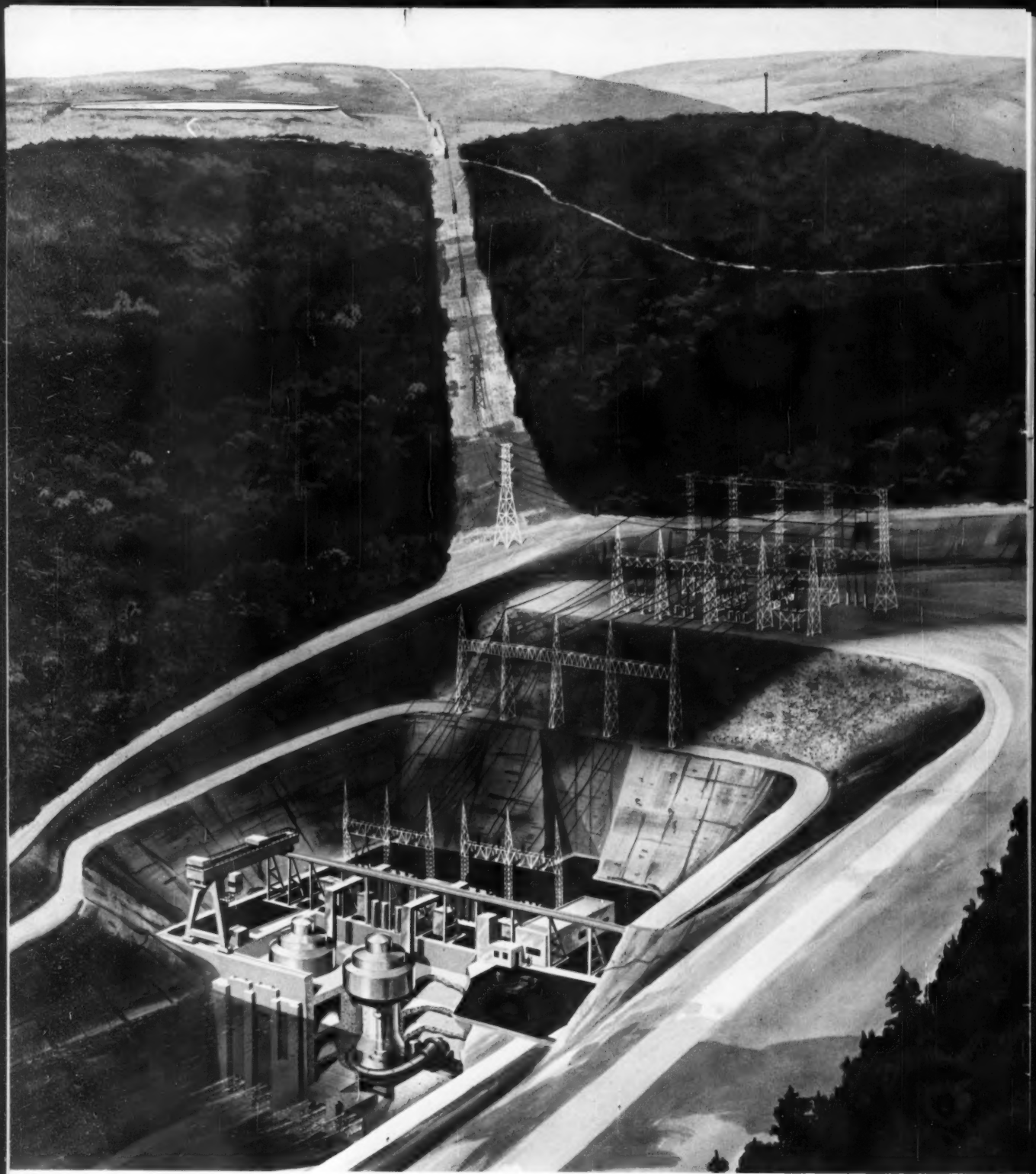


lower than your office desk

## at least 6 reasons why you'll like the new Allis-Chalmers surface-mounted residential transformer

**There are several other reasons too!** *The removable cable compartment speeds installation.* And this compact new transformer makes a good neighbor . . . it's designed and painted to fit right into the background. Its tamper-proof interlocked door makes it safe for use where there are children playing. Disconnect switch and secondary breaker handle are on low-voltage side for added safety.

Get all the facts about the remarkable new Allis-Chalmers surface-mounted residential transformer. Just call your nearby A-C office or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.



**TAUM SAUK**

**Union Electric Co. • St. Louis, Mo.**

Pumped-Storage Project to have the two largest-capacity hydro units ever built. Total capability of these reversible pump-turbines is more than 600,000 HP under 800 ft. head. This—first in pure regeneration—is another example of Allis-Chalmers product leadership. *Write Hydraulic Division, York, Pa. for additional information.*

**ALLIS-CHALMERS**

## FPC Is Being Bypassed on Interconnection Studies

Our recent Management Newsletters (EW, Oct. 9, p 59, and Oct. 16, p 73) indicate the role that the Federal Power Commission has played in promoting and encouraging the interconnection of electric systems. This responsibility was spelled out quite clearly in the Federal Power Act of 1935.

Perhaps without fully considering the implication of its actions, Congress this year started whittling away at FPC's responsibility in this field.

First, not a voice was raised in Congress when Interior Secretary Stewart Udall appointed a committee from his department to study the feasibility of an intertie between the Bonneville Power Administration system and California.

Second, Congress voted $300,000 to the Reclamation Bureau for studies on interregional interconnections. This was done despite the fact that there had been no specific authorizing legislation for such studies.

It has been made clear to the Appropriation Committees of Congress that the Reclamation Bureau will be around next year for another $300,000 to continue its interconnection studies.

Yet, so far as we know, there has been no opposition to these moves which appear to infringe on FPC's responsibilities.

These actions raise several questions that we believe Congress should consider in its next session.

Does Congress intend to abrogate its directives in the Federal Power Act?

By what law does Interior and its Reclamation Bureau receive authority to conduct interconnection studies?

Should not FPC at least participate in such studies?

## Improve Maintenance While Reducing Costs

Upkeep of plant and equipment for the next half year will cost electric utilities about $384 million. If, during the next half year, a 5% savings could be achieved in maintaining these systems, more than $19 million would be saved. Job shortcuts, equipment and tools tailored to well-organized crews, and safety training which dovetails maintenance functions with actual operational environments and objectives, could gain this windfall.

In this issue, the fifth of six Electric Utility Methods special reports for 1961 (p 53) presents articles which demonstrate the variety of innovations which offer potential cost-saving advantages by streamlining the routines of system maintenance. Among them are: replacing the pole under a gang-operated-switch without interrupting service in half the time normally required; rigging a 40-ft-log jib to a 100-ft crane boom to place poles in almost vertical hillsides; and, guarding against a "second contact" in line work to prevent shock accidents.

It is true that a company's background, capabilities, operational objectives, and personalities must be taken into account when defining "a better way" for that particular utility. An excellent job-solving idea for one utility may be meaningless to another. But this does not deny the fact that a broader, more effective dissemination and exchange of electric utility methods, both old and new, does aid management's most important function in this area—to improve maintenance while reducing costs.

- TVA chief asks manufacturers, utilities to act 'in the public interest'
- Those who price according to low-volume, high-profit system are criticized
- Identical bids called 'abuse of the freedom allowed by our economic system'

# Vogel Calls for New Price Policy

A call for manufacturers and utilities to administer prices and rates in the public interest has been made by Brig Gen Herbert D. Vogel, chairman of the Tennessee Valley Authority.

Speaking before a procurement-management conference in Dayton, Ohio, Oct. 13, Gen Vogel chided utilities and manufacturers who priced their products according to the European tradition of low volume and high unit profit. But he had warm praise for those who followed the American practice of establishing a "price which would stimulate a large market, allow a smaller unit profit, but make a larger over-all profit as a result of the larger volume."

Gen Vogel singled out for praise Philip Sporn, president of American Electric Power Co, for his advocacy of low electric rates as the key to growth and performance. "Philip Sporn could not have paid TVA a higher compliment," the TVA chairman said. "What he was telling his (Edison Electric Institute) colleagues was a message TVA has been preaching for many years. By emphasizing low consumer costs, you build a mass market for electricity . . ."

GEN HERBERT VOGEL

Turning to the manufacturers, Gen Vogel observed that "bigness in business, like administered prices, also is here to stay. To pulverize it into many small industries would do a disservice to consumers, weaken the economy, and impair defense capabilities of the nation as well.

"Yet industrial and business bigness and the convenient technique of administrative pricing are not without their dangers. Big business has given rise to big labor. And the hugeness of both has helped bring about big government."

As an example of the dangers inherent in the practice of administrative pricing, Gen Vogel referred to the recent antitrust troubles of the manufacturers. And he cited several instances regarding turbine-generators, transformers, and insulators, where prices were administered at a too high level until the "injection of the competitive factor" brought prices down.

On the subject of identical bids, Gen Vogel said they "are not in themselves a presumption of guilt under the antitrust laws. But whatever the verdict may be with respect to the law, these are practices that should not be condoned. They are an abuse of the freedom allowed by our economic system. They represent shortsighted business leadership."

## EEI Urges Support of NEAR Program

The Edison Electric Institute has voiced its support for the NEAR warning system.

After extensive study of the National Emergency Alarm Repeater (NEAR) system, EEI recommended that the nation's electric utilities participate in the program.

Philip A. Fleger, president of the Institute, stated that "a warning system operating through transmission and distribution lines is a program in which the electric utilities can and should participate in the interest of national defense."

Fleger characterized as a "very fair proposal" the statement made by Defense Secretary Robert S. McNamara last August before the Military Operations Subcommittee of the House Committee on Government Operations. McNamara had said, "If an extensive system test in Michigan proves successful, it is proposed to begin national installation of this household warning system, which operates on electrical impulses imposed on regular power lines. Federal funds would be used to cover the cost of the signal generators. The receivers would be sold to the general public."

The small alarm receiver would plug into an ordinary appliance outlet on the electric customer's premises.

The NEAR system has been undergoing tests on the lines of Consumers Power Co in Michigan for more than a year.

## Dedication Set for New Engineering Center

Dedication of the New United Engineering Center in New York is set for Nov. 9 at 2 pm, with Willis Thompson, president of United Engineering Trustees, presiding.

Honorary chairman will be former President Herbert Hoover. He will present the Hoover Medal, one of engineering's highest awards, to Dr Mervin Kelly.

Following the dedication ceremony, guided tours of the new 20-story building will be conducted.

The building is at 47th St and First Ave, across from the United Nations Plaza.

# AEC Weighs Sale of Nuclear Fuel

**Agency wants economics of A-plants on more realistic basis; JCAE to examine entire nuclear subsidy system**

The Atomic Energy Commission is studying desirability of permitting private ownership of nuclear reactor fuels. The study will be ready by Dec. 1.

The study is being handled by AEC's operations analysis and forecasting division, under the direction of Paul C. Fine. Its recommendations will go to the five-man commission in time to ready final legislative requests when Congress returns in January.

The AEC study comes at a time when Congress plans another close look at the types of government financial assistance given to the private nuclear energy industry—both utility power reactor operators and reactor-equipment manufacturers.

The Congressional Joint Committee on Atomic Energy plans to examine effectiveness of direct and indirect federal subsidies now provided atomic businesses in accelerating power reactor construction.

Many at AEC now urge shifting from present government ownership of nuclear fuels and leasing arrangements with utilities to avoid build-up of large government inventories. The rationale is that private ownership would help get away from establishing nuclear fuel costs on a subsidized basis.

But not all at AEC think a switch to direct fuels sales would bring advantages. Commission experts on the civilian nuclear power program feel outright sales will tend to discourage future construction of power reactors, and may even kill some reactor projects underway.

If the switch were made this year, these experts say, fuel cycle costs for reactor projects underway, such as Southern California Edison's 365-Mw pressurized-water reactor, would be doubled.

The strain of adding $24 million to the So Cal Edison project, the cost of the fuel inventory, would crush all hopes for an economic return from the plant, the civilian reactor experts say.

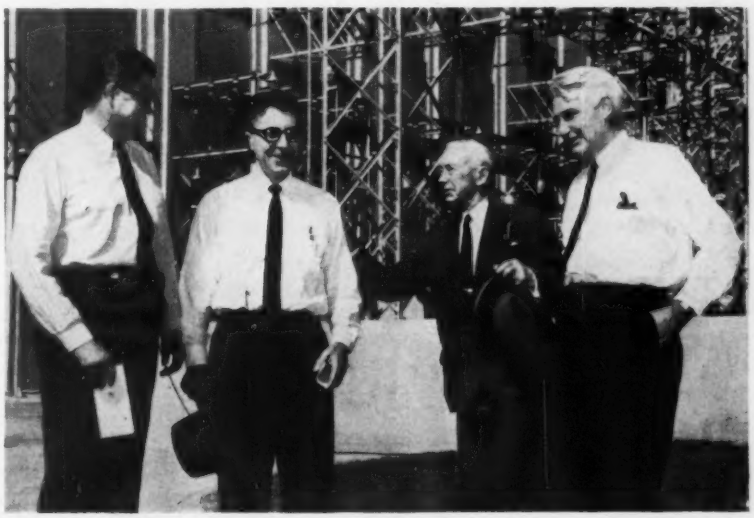
The considerations on which most reactor projects due for near-term construction give only the barest economic assurances, including Pacific Gas & Electric's proposed commercial-sized boiling water reactor. But under direct sales, this small margin of balance would be destroyed, leaving no economic basis for utilities to build central station power reactors now or in the years to come.

By and large, most utilities contacted by the AEC study group feel private ownership of fuels would be advantageous.

Edison Electric Institute told the commission, however, that the transition should be a gradual one and extend over a period of time from ten to 20 years. EEI also felt that the commission should devote more research to building up uranium-233 and plutonium technology, along with any transfer to direct sales. This would partially offset the loss in plutonium buyback now available.

Behind the nominal aims of the JCAE study, Washington nuclear sources say more things are going on than meet the eye, however. By their public statements, Rep Chet Holifield (D-Calif.), JCAE chairman, and Sen Clinton P. Anderson (D-N. M.), former JCAE chairman, show they are still angry at industry for the successful private campaign waged against installing generation at the Hanford NPR project. Both as a result are still threatening the lifting of federal aid to investor-owned utilities.

Current speculation is that the upcoming study will conclude that federal financial grants to industry under the cooperative "partnership" program should be ended, and that a government reactor construction program should take its place.



## Federal Power Commissioners in Field

To get a first-hand impression of the industry they will regulate, the four new Federal Power Commissioners led by Chairman Joseph C. Swidler took to the field in recent weeks. First stop was Alabama Power Co where Swidler (second from left) and Commissioner Lawrence J. O'Connor (left) chatted with Board Chairman Thomas W. Martin and President Walter Bouldin of Alabama Power Co, before inspecting major installations.

Second stop was the Tennessee Valley Authority. Swidler explained that these utilities had been chosen because both involve river systems in combination with large thermal stations.

# Russian Planner Questions 'Numbers Game'

## Present method of economic planning for future generation disturbs A. Berg, who favors increased computer studies

*Moscow (McGraw-Hill World News)*—The question is being raised in the Soviet Union whether the numbers game being used in setting economic goals under long-range Communist Party programs may do more harm than good.

Academician A. Berg, who writes often on economic planning subjects, asks in an *Izvestia* article, "Who can say how much electricity we shall need in the year 2000? Presuming that power demand will continue to treble in quantity every ten years—as has been estimated for 1960 to 1980—in the year 2000 we shall have to produce some 27 trillion kwhr.

"But is this right? I don't think so, though that is precisely how we have been estimating everything so far—on the principle of the more the better."

(For a critique of the latest Russian program, see EW, Oct. 16, p 32.)

Berg notes a steady increase in the size of power generating units, in the speed of steel rolling mills, etc.

"But what speed do we really need? And what price do we have to pay for these records? Would they really be advantageous if we took into due account all outlays of the present and the future?"

Observers note that Soviet planning habitually accents high production and low unit costs calculated at the manufacturing sites. But the planning has often failed to take fully into account additional costs such as transportation and warehousing. The result often has been giantism in which producing units have been built larger in size than the true economics of the situation would warrant.

The Russian academician also notes that the number of engineers, doctors, and scientific workers is currently doubling every ten years while the population as a whole takes 35 to 40 years to double. He hints that it is high time to cut down the training rate in order to avoid "utterly wrong proportion between different categories of able-bodied population."

Turning to his main theme—need for mathematical methods in planning—Berg says the proper proportion between the branches of the economy "cannot be solved satisfactorily by means of crude reckonings with the help of simple adding machines or abacuses." Instead, he says computers must be used in planning.

"Many of our economists and planners are accustomed to old antiquated methods of work. The Party and government have pointed out more than once that this situation cannot be tolerated. However, nothing is being done to remedy it."

# Peaks, Outages Cause CEGB $3-Million Loss

## 'Teething troubles' of new turbogenerators, 12.1% jump in peak load over previous year put British in the red

*London (McGraw-Hill World News)*—Upsurge in electricity demand, with 103,000 million units sold against a budgeted 98,000 million units, contributed paradoxically to a $3-million loss by the Central Electricity Generating Board last year. The Board had planned for net surplus of $21 million. Excess demand, said the Board Chairman Sir Christopher Hinton when presenting the annual report recently, had to be generated on costly, old, low-efficiency plant.

### Generator Outages Expensive

But other powerfully contributing factors, he said, were outages of new giant turbogenerators caused by "teething troubles," which due to their large unit size represent a loss of $120,000 a day while out. Also costly were building programs of generating plant and grid distribution network which were slightly behind schedule. Although relatively small in themselves, Sir Christopher noted, they proved critical in view of the small percentage profit margins, and the large revenue of over $1,200 million. Fuel took about half this figure and interest charges account for another $342 million.

According to the Electricity Council, whose report is published jointly with the CEGB report, electricity sales during the year soared to a postwar peak 12.1% above last year's totals, an increase rate unparalleled since 1950. The Council, which controls the distribution of the nation's electricity, recorded a rise in revenue of $210 million to $1,860 million. But net profits slumped from $76 million to $45 million due to pay awards, oil fuel cost increases and a drop of $24 million in domestic appliance sales which cuts the Council's profits on sales of fittings and installations.

### Peaks to Rise to 12% by 1965

The report also warned of a 12% increase in the peak load demand by 1965 compared to 1958 estimates. This is expected to raise the peak load demand by 1965 to 33,000 Mw, reaching 38,000 Mw two years later. Meeting the higher loads, the report believes, will raise the 1958 capital estimate figures as much as $560 million to cover the period up to 1964-65. And in the following years, expenditure will top $1,120 million annually. The extra load will be met by thermal stations, Sir Christopher told *Nucleonics* (a McGraw-Hill publication), and not by a revision of the nuclear power

program.

To meet the new capital expenditure, there are likely to be rate increases next year. Last year, the average price of electricity to consumers actually fell from 18 mills to 17 mills.

Commenting on sales trends, the report regards an increase of 17.6% in domestic consumption as reflecting growing switch from coal fires to electrical household heating in Britain.

About 97% of all of the households in the UK are now connected to the supply, says the report, and the annual consumption per consumer has risen to 2,271 units. Industrial sales showed an increase of 8%, mostly in the iron, steel and chemical industries.

# Indian 5-Year Plan: Generation to Go Up 123%

*Bombay (McGraw-Hill World News)*—Total power generation in India will increase by 123% in the next five years—from 1960-61's installed capacity of 5.70 million kw to 13.40 million kw in 1965-66. At least 12.69 million kw of the projected figure will be in commercial operation.

Per capita generation will rise from 45 kwhr in '61 to 95 kwhr in 1966. New Delhi and the state governments will spend $2,181,900,000 on the power program.

India's Third Plan will heavily emphasize industrial power, which, by 1965-66, is expected to amount to 28,400 million kwhr, 63.1% of total anticipated consumption.

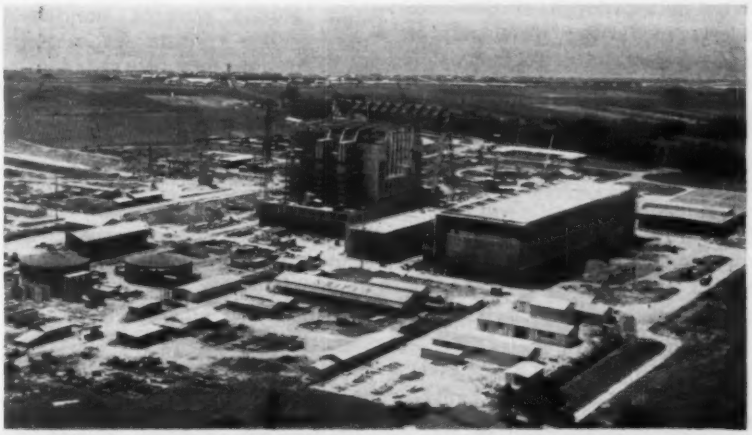
Also in five years, domestic and residential light and small power, according to estimates, will account for 7.6% of total consumption; commercial light and small power, 4.2%; traction, 4%; public lighting, 0.9%; irrigation, 2%; transmission losses and consumption in auxiliaries, 14%.

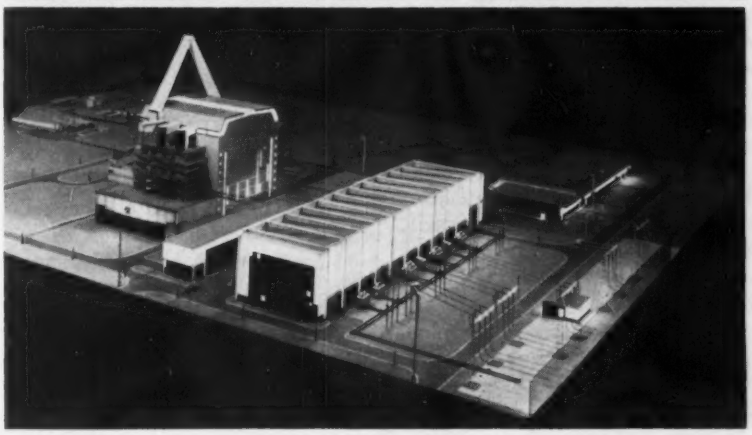
State-owned public utilities, company-owned installations, and self-generating industrial establishments will supply 34,500, 6,500, and 4,000 million kwhr, respectively.

Since the accent is to be on industrial power and since industry is to be dispersed into undeveloped rural areas, the rural electrification program will also be accelerated. More than $216 million will be spent to bring power to villages whose only light source now is tiny oil lamps. Plans call for increasing by 100% the number of towns and villages with populations under 5,000 that have electricity. In March 1961, 19,861 such areas had electricity; 38,458 will have it by 1966.

Small 10 to 100-kw hydro plants will be used in rural areas. Also, plans call for expanding regional grid systems in the states of Madras, Madhya Pradesh, Bihar and West Bengal, Punjab and Rajasthan.

An interstate grid is contemplated between Uttar Pradesh and Madhya Pradesh. The United States-aided Rihand hydel system will integrate the Uttar Pradesh and Madhya Pradesh thermal stations.





## Italian A-Plant to Be Ready in '62

Latina nuclear plant, rated at 200 Mw, is taking shape on the Mediterranean coast, about 40 miles south of Rome. The single reactor plant, similar to Bradwell in England, will be $CO_2$-cooled, graphite-moderated and fueled with natural uranium. It will produce steam at 770 psia, 703F. Owned by Societa Italiana Meridionale Energia Atomica (SIMEA), the station is scheduled for 1962 completion. Artist's rendering (lower photo) shows how the completed plant will appear.

# News Scope

**GROUND-BREAKING** — Carolina Power & Light Co will break ground at Skyland Oct. 18 for its proposed 255,000-hp steam-electric generating plant. Preliminary work is already underway at the 760-acre site between Skyland and the French Broad River. The initial unit will go on the line in mid-1964; the plant will ultimately be capable of generating 1,130 million kwhr. CP&L plans a 300-acre lake at the site as a source of cooling water for the condensers.

**ADVICE**—California Department of Water Resources has retained Bechtel Corp to provide engineering advice in the design of the huge underground power plant part of the Oroville Dam project. Bechtel, in collaboration with the Oroville Dam Consulting Board, will assist with problems of rock mechanics, layout and arrangement of plant equipment, and hydraulic design of certain features. Oroville will have a 600-Mw installed capacity, with provisions for enlargement to 1,200 Mw. A maximum of $95,000 has been provided for Bechtel's services.

**YANKEE STATISTICS** — Plant factor a little over 95% at Yankee Atomic Electric Co was logged for August. The plant shows also these statistics: just under 100 million kwhr for August alone; accumulated total of 681 million kwhr gross to Sept. 20; operation at 150 Mw gross when at licensed full-power reactor level of 485 tMw, or about 140 Mw net as compared to 136 Mw designed for at this thermal level.

**MERGER**—Directors of Public Service Co of Colorado and Colorado Central Power Co have approved merger plans. Public Service will be the surviving firm.

If plans are approved by shareholders, holders of Colorado Central common would receive one share of Public Service for each 1⅔ shares of Colorado Central. Merger is expected to be effective Jan. 1, 1962.

**CITIZENS' FIRST**—With the acquisition of Brimfield Water Co, serving a residential area near Akron, Citizens Utilities Co began its first operations in Ohio. Citizens has also purchased West Suburban Utilities Co, serving a newly developing area of suburban Chicago, and the Felton Water Co, with territories near San Francisco. The acquisitions bring to 15 the number of properties acquired by Citizens so far this year.

**SPANISH MERGER**—The Marques de Suanzes said that the state agency which he heads will back the creation of a single industrial body including investor-owned and state enterprises, and armed with legal powers, to plan and build Spain's future atomic powered industry. Suanzes says private enterprise, linked to state industry, would result in a stronger technically equipped unit to plan and build.

**PEACE**—Unofficial reports from Vancouver, B. C., indicate that the British Columbia government is forming its own construction company to build the proposed Peace River dam and other parts of the power project. Other reports hold that B. C. Electric is seeking to buy the International Power and Engineering Consultants Ltd.

**VOLGA PLANT** — The Soviet Union recently began operating a Volga River power plant which it calls the largest in the world. The project's 22 generators, rated for a 2.65-million-kw capacity, will produce 11.1 billion kwhr a year, according to Soviet calculations. The dam, on the Volga just above Stalingrad, rises about 150 ft above the river bed. Cost of electric power production, Soviet authorities assert, is less than one-tenth of a cent per kwhr.

**AWARD**—Public Service Electric & Gas Co has won a trophy for the best 1961 stockholder annual report filed by a large electric utility. In the classification of utilities with operating revenues over $100 million, Consumers Power Co was runner-up and New York State Electric & Gas Co placed third. The survey is sponsored by Financial World magazine.

**RATE REVISION OKAYED**—A North Carolina Superior Court judge has upheld the State Utilities Commission ruling that allows Carolina Power & Light Co to revise its rates for textile mills. Attorneys for the 30 textile mills which have banded together into a Carolinas Committee for Industrial Power Rates and Area Development, Inc, said they would appeal the case to the state supreme court. The mills object to a fuel adjustment clause that provides that any fluctuations in the price of coal will be tacked on or taken away from power rates. They assert that the company can economize in other phases of production, and thus avoid higher power bills which they feel are unreasonable. Carolina P&L declared that it would not be receiving more revenue from the boost, that it was just meeting demand cost. The commission agreed and approved the rate hike in May.

**RED RESEARCH**—The phenomenon of corona on high-tension lines is one of the studies the Soviet Union will conduct at its new institute, located on Mount Aragaz at a 10,500-ft altitude. The research center, in Armenia, will primarily do studies for the high-tension line from Nurek hydro project (in Tadzhikistan) to Tashkent (in Uzbekistan). This 500-kv line will at times cross altitudes exceeding 11,500 ft above sea. Data from earlier corona studies undertaken at 3,280 ft (near Yerevan) and at 6,500 ft (near Sewan Lake) have been used in building two high-mountain power lines.

**PACT**—A new US-Canada treaty is being sought quietly in Ontario in the hope that up to 35% more water may be taken from Niagara Falls for generation during the tourist season. It is believed that the water flow can be reduced from 100,000 to 65,000 cfs without impairing the scenic beauty. A 1950 treaty calls for a minimum flow of 100,000 cfs during daytime in the tourist season and not less than 50,000 cfs at any other time. Scenic requirements consist of maintaining a green color and an unbroken falls crest line.

R. G. **RINCLIFFE,** Philadelphia Electric Co, tells PEA what resources investor-owned electric companies are planning

P. A. **FLEGER,** president of EEI and Duquesne Light Co, cites industry's role in a free enterprise economy

# PEA Told Interties Spell Growth

## Rincliffe and Fleger discuss pools and interconnections as indexes of progress at group's Philadelphia meeting

Interconnections have boosted the economy and reliability of today's investor-owned electric utility companies' systems, the Pennsylvania Electric Association was told recently at its annual meeting at Philadelphia, Pa.

Over the past 20 years, these systems have expanded and strengthened, enlarging their generating capacities through interconnecting, said R. G. Rincliffe, Philadelphia Electric Co.

Noting that the first integrated pool was in his state 33 years ago, Rincliffe continued: "What we must do now is make our customers understand that through present and planned resources and power pooling, the investor-owned companies continue to meet America's power needs, and that this process is in competent hands."

"No small factor in America's electric leadership is the continuing interconnection and pooling made possible by the development of extra-high-voltage transmission," declared Philip A. Fleger, president of both Edison Electric Institute and Duquesne Light Co.

Fleger noted that today nearly all systems east of the Rockies are interconnected, and that west of the Rockies interconnected operation has been a fact for several years.

"Over the next 20 years, more than $143 billion for construction of electric systems will come out of the operation of the industry in a free enterprise economy," he said, adding that in those decades investor-owned utilities will contribute nearly $102 billion in federal, state, and local taxes.

"We offer our pledge," he said, "that the capacity to produce power will be wholly provided under the free enterprise system and financed entirely through the free money market."

### Shipments Up 5%

The total value of electric manufacturing shipments last year was $22.6 billion, 5% over 1959, the convention was told by J. F. Miller, National Electrical Manufacturers' Association. He estimated that shipments will reach $50 billion by 1970.

Discussing the floating nuclear power plant and the Delaware River Basin plans, Col T. H. Setliffe, US Army Engineer District, said that the first was intended to supply electricity to military installations and port cities cut off from normal service by disaster.

"This floating nuclear power plant," he said, "is designed to provide a large, mobile block of generating capacity to meet priority requirements, political or military, domestic or foreign, on short notice, when and where it is wanted, without a tremendous logistic 'tail.'"

His Delaware River Basin report recommended a plan for control and use of the basin's water resources for the next 50 years. The area, he explained, has 13% of the nation's population, generates 17% of the national personal income, and has one of the greatest concentrations of heavy industry.

He said a bill to be submitted to Congress early in 1962 would recommend two conventional installations for 67 Mw of capacity at Hawk Mountain and Tocks Island and a pump-storage installation at the latter for 366 Mw.

Penelec received the award for low accident frequency rate, and West Penn Power for the greatest reduction in that rate. Duquesne Light was honored for having the fewest lost-time shock and burn accidents.

Park L. Lawson, Penelec, was named the new president, succeeding G. R. Parry, Metropolitan Edison Co. New vice presidents are P. M. Alden, Philadelphia Electric; C. S. Bowden, Pennsylvania Power Co; and, R. W. Hurd, West Penn Power. Franklin H. Lichtenwalter continues as managing director.

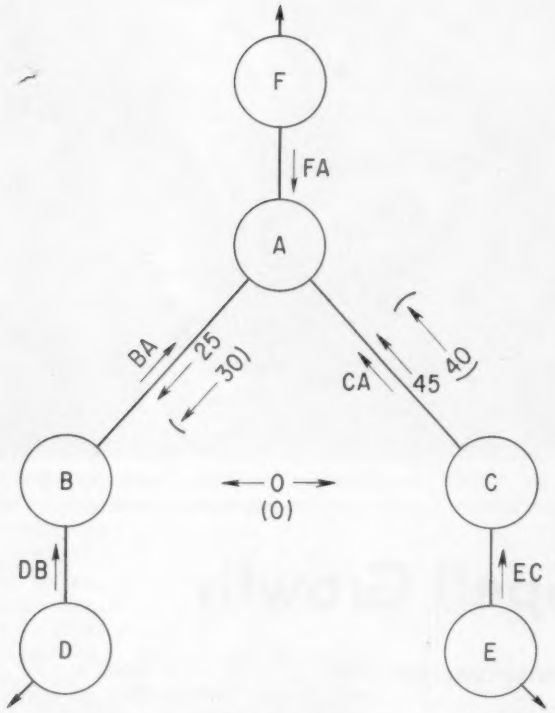



**FIG 1—ENERGY ACCOUNTING** for simple, radial interconnections is not difficult. Each company deals with adjacent companies only. Scheduled flows and direction are in parenthesis; actual flow and direction have no parenthesis

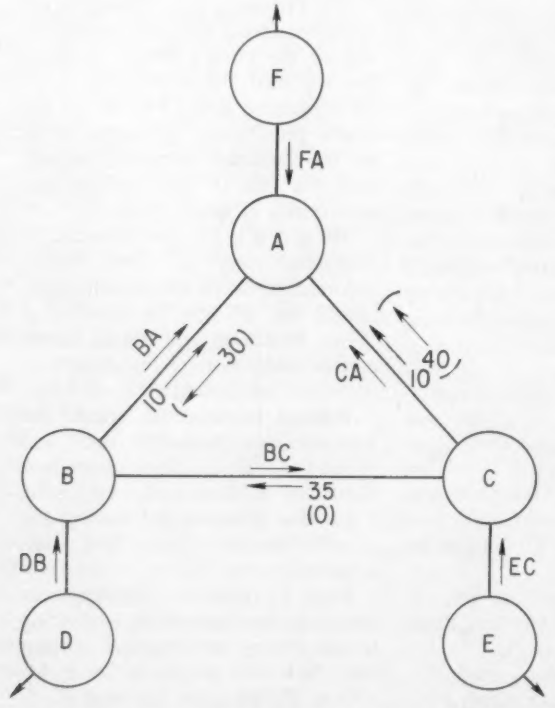



**FIG 2—LINE BC** makes energy accounting more complex. Scheduled flows are same as Fig 1 but meters BA, CA, and BC are in themselves unable to record scheduled transactions between any two of three companies

# How to Account for

## Method requires exchange of information with neighboring companies only; now used on two southeast systems, the proposed system is being considered for others

**W. R. BROWNLEE**, Power Pool Manager, Southern Services, Birmingham, Ala.

Energy accounting becomes a serious problem as the interconnected system becomes larger and more complex. The company that owes the energy often doesn't know which company to pay; and the company that is owed energy doesn't know from which company to collect. To make the problem more complex, different classes of energy are exchanged over the interconnections and these must be repaid in kind.

A number of attempts have been made to simplify this accounting. This article describes first the older systems and concludes with a new system which has the following advantages:

- The method can be expanded easily to much larger interconnections.
- Exchange of information is limited to neighboring companies only.
- Each company has only to agree on meter accuracy in his interconnections.
- The method is compatible with the older methods.

### Simple Radial Interconnections

In simple radial-tandem interconnections with patterns as shown in Fig 1:

**1.** Sets of meters at DB, BA, CA, FA and EC record actual power flows between definitely identified pairs of companies. DB designates energy flow from D to B, etc.

**2.** Any two adjacent companies may schedule interchange without disturbing system frequency of affecting scheduled flows on any lines except those directly connecting those companies.

**3.** Inadvertent, or "unintentional," energy balances are identified as between pairs of companies and may be reduced whenever mutually convenient. For example, assuming imperfect control by D but perfect control by B, D will owe energy to B and B will owe the same amount of energy to A. However, energy recorded on DB meters will be balanced by arrangements between D and B and that recorded by BA meters by arrangements between B and A. Thus, if B prefers, he may arrange for a simultaneous balance of energy. However, this is not necessary.

**4.** A may secure emergency energy from B and B, in turn, may arrange for D to supply simultaneous emergency energy to B. Under usual circumstances, D may prefer to leave B owing him emergency energy (to be returned in kind when needed) and B will be satisfied to have A owe him emergency energy. Either or both transactions may be cleared in cash if desired.

In the illustrative flows and schedules involving A, B, and C, A will then owe B 5 Mwhr of inadvertent

# Energy in Complex Interconnections

energy and A will also owe C 5 Mwhr of such energy. All such deviations are identified between pairs of companies.

### Add Network Feature

With the addition of a direct interconnection between companies B and C, using meter BC, Fig 2, BA, CA, and BC may record substantially different power flows even though perfect control existed before closing tie BC. The schedules and flows involving A, B, and C shown on Fig 2 vs those shown on Fig 1 illustrate such loop flows. Accordingly, meters BA and CA, even taken with BC, are in themselves unable to record the transactions between any two of the three companies.

### Phase Shifter Solution

One early solution to loop operation was the installation of a phase shifter in the final or loop-closing interconnection to hold flows close to zero or to scheduled amounts. The cost of phase shifters could well be justified by the additional benefits of interconnection, provided no better solutions were available. However, there are disadvantages to this type of solution: high investment, thermal bottlenecks, incomplete control, and transmission losses. These can be avoided by a simpler method of handling metering and billing on the interconnected system. Current use of phase shifters is confined largely to the control of power through parallel impedances having substantially different characteristics.

### Balance Sheet Method

Contributing to the short life of the phase shifter method was the early development of the Balance Sheet or BS system. In order to solve the problems of Fig 2, a "banker" collects information at agreed intervals from each company involved in the interconnected area. Company A in Fig 2 supplies the following information to the banker:

Actual flow in Line AB
Scheduled interchange with B
Actual flow in Line AC
Scheduled interchange with C

Companies B and C each send corresponding information to the banker. From such data, the banker, probably one of the three companies, can first, assume that the scheduled transactions actually occurred, second, determine the overgeneration or undergeneration of each company, and third, provide periodic statements to each, showing the amount of such deviations from schedule, usually divided by arbitrary hours into peak-period and valley-period energy.

With only three companies to consider, the banker is also able to determine the amount of inadvertent energy each one owes and to whom it is owned. Thus, he can suggest balancing operations to A, B, and C. Where more than three companies are operating in a loop or network, arbitrary choices are involved but ultimate balance is feasible, at least within the bounds of the pool monitored by one banker.

To provide optimum equity, the balancing of inadvertent interchange should be arranged for mutually acceptable times and amounts. For example, if B finds he has accumulated a debt of peak-period energy to the pool but has just taken a large, low-energy-cost generating unit out of service for two weeks, he may not be able to repay the peak-period energy during those two weeks except at a cost much higher than that which was avoided when the inadvertent energy was received by him. Also, A may have experienced sudden heavy rains and may not wish to accept the energy until stream flows have decreased. Furthermore, the original accumulation of the peak-period debt by B was not necessarily caused by any imperfection in his control performance but quite possibly as the result of his strict adherence to his assigned contribution to the maintenance of interconnected system frequency. Thus, he is entitled to help select the repayment time.

In a pool of a large number of companies, several will be "long" and several "short" at the end of any month, and the banker will need to use arbitrary choices if he wishes to suggest which companies might get together and arrange a balancing operation. Also, growing unbalances with other pools or regions may become unwieldy especially as more geographic areas are tied together for continuous parallel operation. However, the Balance Sheet system is workable and can be made equitable except for the accounting burden imposed upon the company acting as banker.

### 'Guess Who Got It' Method

The growing accounting burden on a banker and the increasing complexity of the required bookkeeping has led to recent urgings to adopt the "Guess Who Got It" or GWG method, sometimes called the SBOM (Somebody Owes Me) method. In such an arrangement, each company in an interconnected area records only his own energy unbalance with the entire area of parallel operation. If only a few companies in adjacent areas are so operating, this method may appear to work for a while, but pitfalls accumulate with the geographic extent of this method and with time.

If a company accumulates a considerable balance owed to him, due largely to his valuable contribution to the maintenance of system frequency, no one can tell him whom he should ask to return it. Assuming that he can secure a complete list of debits and credits of all those operating in parallel and find, say, ten companies who owe the area amounts similar to the amount owed to him, each of them when approached might maintain that he owed this balance to someone else.

Time does not improve this condition, and any unilateral attempts to balance could have adverse effects. The increasing numbers and expanded uses of interconnections highlights the difficulty of maintaining both full cooperation and untarnished equity under the far-flung circumstances eventually involved with the "GWG" Method.

(*Continued on next page*)

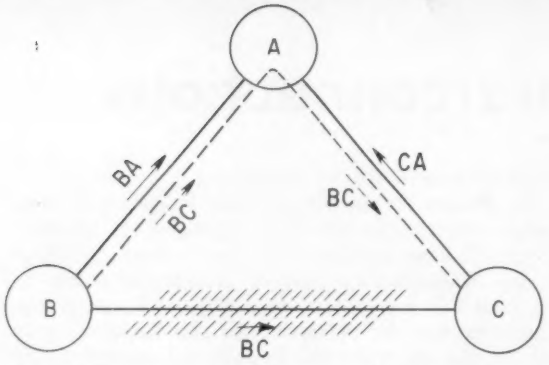



**FIG 3—KNOW WHAT HAPPENED** method is based on interpretive geometry where energy recorded on BC meters becomes a component of energy from B to A and from A to C as though line BC were relocated

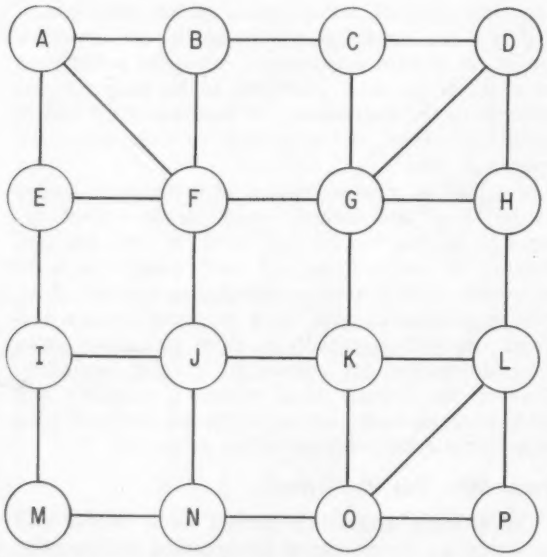



**FIG 4—16-COMPANY, 27-LINE** network of hypothetical system may be reduced to a pre-selected radial equivalent by the interpretive geometry process of Fig 3

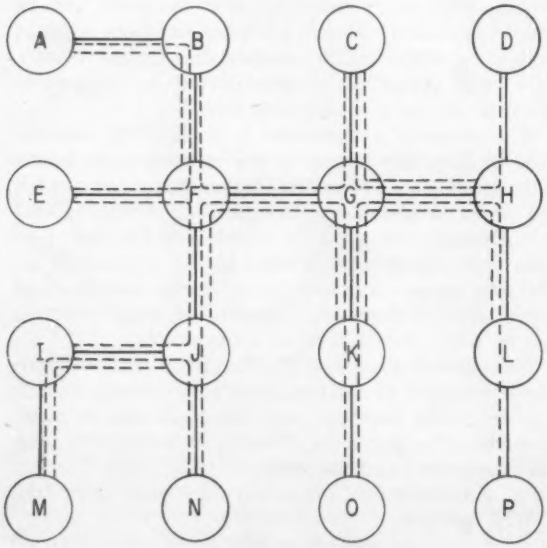



**FIG 5—RADIAL TRANSFORMATION** of this type is one of many possibilities for the 16-company, 27-loop system of Fig 4 when the interpretive geometry system of Fig 3 is applied. Resulting meter interpretations are shown in table

### 'Know What Happened' Method Is Simpler

About the time the "Guess Who Got It" method began to be promoted, some recent experience was obtained with the "Know What Happened" or KWH method, which had been used on a small scale two decades ago. Definitive energy accounting can be provided for a simple three-company loop, part or all of a region, or an entire interconnected system without recourse to a banker and with interchange of information limited to neighboring companies.

The basic principle is illustrated in Fig 3 where companies A, B, and C have selected BC as the undesired portion of the loop, for accounting purposes, to be deleted by the indicated interpretation. Line BC may be viewed as being pulled upward to intersect the circle representing company A. This is equivalent to an (informal) agreement that interchange between B and C shall be, at all times, either zero or precisely the amount of energy scheduled to be interchanged between them.

Such an assumption requires that the actual energy flows from B to C, less any scheduled BC interchange, be interpreted as:

1. A component of energy flow from B to A and
2. A component of energy flow from A to C.

The resulting net interchanges between companies are thereby defined as follows:

| Net Interchange | Meter Readings |
|---|---|
| From B to A = | BA + BC (less schedule from B to C) |
| From C to A = | CA + CB (less schedule from C to B) |
| From B to C = | Schedule |

This shows that no inadvertent energy can accumulate between B and C. At appropriate intervals, A is supplied with the meter readings of BC to determine his final separate balances, peak and valley, with B and with C. Thus, with the reporting of only one additional meter reading A, B, and C each has a simple means of determining his balance with the other two, requiring no arbitrary action by anyone, such as a banker, and no guessing.

In general, each company shares half the responsibility for the accuracy, testing, and reading of meters in a direct connection to another company, and this also applies to meter CB. In determining his energy accounting accuracy and control performance, A has no direct interest in the accuracy of meter CB as long as C and B, who have complete responsibility for those meters, agree on the readings. This they would have to do under any system of accounting.

Similarly, company A has no need for the reading of CB in order to determine his hourly generation control performance. That is, meters BA and CA, both under supervision of A, will determine the net unbalance of A with B and C combined, and the BC meter readings merely provide a means of separating the ac-

counts of B and C with A. Accordingly, all of the advantages of the radial system, including scheduling between adjacent neighbors, definite accounting for energy, and simple balancing arrangements, are achieved with this Know What Happened system.

### Method Can Be Expanded

A general procedure for reducing a multiple-loop system to one of its radial equivalents is:

**1.** Decide which loop paths should be deleted by interpretation to leave the desired radial pattern.

**2.** Choose for each deleted connection a parallel path through other systems, thus determining the required interpretation of each.

**3.** Arrange to supply meter readings from the deleted circuits to those companies needing them for final periodic accounts (daily, monthly, etc.)

One of the many possible applications of this procedure to a 16-company, 27-line system is shown in Figs 4 and 5. Any part or all of a large network may thus be reduced to a pre-selected radial equivalent. The accompanying table shows the proper interpretations for the deleted solid lines of Fig 4 which are readily determined by following the dotted equivalent lines of Fig 5. Exchanges between each pair of companies retaining a radial path are shown as the sum of the readings of two to five sets of meters. Exchanges such as between B and C are precisely as scheduled.

A simple check of the algebraic sum of any of the uninterpreted paths, Fig 5, of a company should provide the same answer as the sum of the grid meters before interpretation, Fig 4. For example, the summation of energy leaving company F is, from the table:

$$\begin{array}{l} FB = FB \\ FE = FE \\ FG = FG \\ \hline F = FB + FE + FG + 0 + FA + 0 + 0 + FJ \end{array} \qquad \begin{array}{l} + EA + FA + CB \\ + AE \qquad\qquad + IE \\ \qquad\qquad + BC + EI + FJ \end{array}$$

which represent the five original connections surrounding company F in Fig 4.

### Numerical Application of the Method

Applying the principles discussed to the numbers shown on Fig 2, using equation (1):

$$\begin{array}{lrcrcl} \text{Delivery C to A} & = & 10 & + & 35 & = 45 \text{ Mw} \\ \text{Delivery A to B} & = & -10 & + & 35 & = 25 \text{ Mw} \\ \text{Delivery B to C} & = & 0 & & & \end{array}$$

These deliveries are precisely the same as the initial flows of Fig 1 before the addition of line BC. Thus the loop of Fig 2 is reduced to the radial arrangement of Fig 1 for operating purposes.

Of the four general methods described, only the Know What Happened method provides substantially all of the operational advantages of radial connections for a complex network of interconnected companies. It is compatible with other methods and may be adopted in small or large steps to cover any desired area of interconnections.

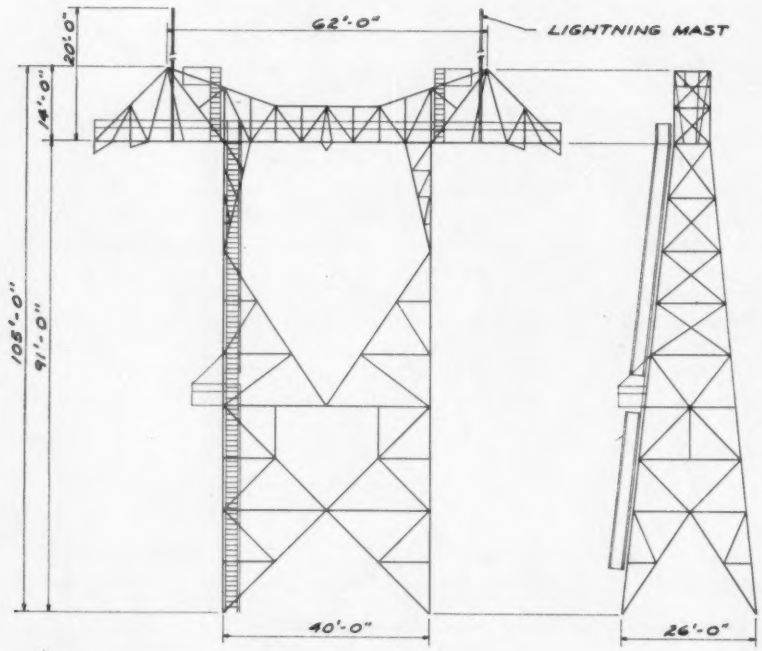
## Radial Interpretation of Meter Readings Resolved from Fig 5

| From | To | Direct | Exchange Energy Is the Sum of Meter Readings Indicated — Interpreted | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | AB | AE | AF | * | * | * | * | * | * | * | * | * | * |
| B | F | BF | AE | AF | BC | * | * | * | * | * | * | * | * | * |
| E | F | EF | EA | * | * | * | * | EI | * | * | * | * | * | * |
| F | G | FG | * | * | BC | * | * | EI | FJ | * | * | * | * | * |
| C | G | CG | * | * | CB | CD | * | * | * | * | * | * | * | * |
| D | H | DH | * | * | * | DC | DG | * | * | * | * | * | * | * |
| H | G | HG | * | * | * | DC | DG | * | * | HL | * | * | * | * |
| G | K | GK | * | * | * | * | * | EI | FJ | HL | * | * | * | * |
| I | J | IJ | * | * | * | * | * | IE | * | * | IM | * | * | * |
| J | K | JK | * | * | * | * | * | IE | JF | * | IM | JN | * | * |
| L | K | LK | * | * | * | * | * | * | * | LH | * | * | LO | LP |
| P | O | PO | * | * | * | * | * | * | * | * | * | * | * | PL |
| M | N | MN | * | * | * | * | * | * | * | * | MI | * | * | * |
| N | O | NO | * | * | * | * | * | * | * | * | MI | NJ | * | * |
| O | K | OK | * | * | * | * | * | * | * | * | MI | NJ | OL | PL |

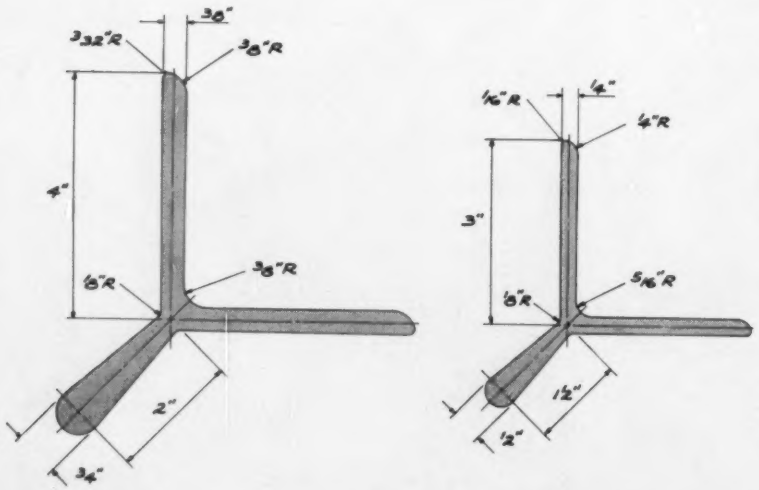
# Aluminum 750-Kv Tower Aims at

## 105-ft Alcoa structure has custom-designed compression members in a rectangular, conventional configuration

J. E. WILLIAMS and D. A. SALVETTI,
Alcoa Structural Div, Aluminum Co of America, Pittsburgh, Pa.




**TOWER** No. 4, northernmost of the towers in the longer EHV Project section, is shown in longitudinal and traverse views, together with major over-all dimensions




**CUSTOM DESIGNED SHAPES** in the aluminum tower include this typical Y-section, which is incorporated as chords, crossarms, and other compression members

The 105-ft aluminum transmission tower supplied to the General Electric Co's Project EHV at Pittsfield, Mass., represents Alcoa's effort to fabricate of light metal a 750-kv self-supporting structure of acceptable design for the least over-all cost.

Erected last December, the tower is No. 4 among the 18 towers in the 4.3-mile line and hence the northernmost of the 15 towers in the longer, south portion of the two-section line. It consists of nonstandard structural shapes tailored to be efficient compression members in a conventional configuration based on the tower-shape preferences of most utilities.

Design loads, with appropriate overload factors prepared by Stone & Webster Engineering Corp, indicated a rectangular cross-section for this tower, as traverse over turning moments exceed the longitudinal ones considerably. The specific configuration was the result of Alcoa's studies of layouts within the clearance specifications of the project. Formulas used in the design of individual tower members were based on the yield strength of alloy 6061-T6.

The tower's vertical leg design facilitates the attachment of platforms, enclosed ladders, and walkways. Tubular aluminum lightning rods are located at each static wire and extend 20 ft above the tower top on all towers throughout the south portion of the line.

Special structural shapes incorporated in the tower include tubular members and Y-section shapes for chords, crossarms, and other compression members. The latter have proved to be considerably more efficient than conventional angle sections besides showing a weight saving of 10 to 13% over standard sections in the ranges of length to radius employed.

The new Y-sections were de-

# Acceptable Design at Least Cost

signed to achieve increased columnar efficiency by improving the ratio of least radius of gyration to a sectional area and to develop a section with improved local buckling stability while retaining ease in the attachment of web members.

The tubular members of the Alcoa tower have liner-inserts at the formed ends. Although extruded tubular members are more efficient than angles or Y-sections, splices and other connections are more complicated. Accordingly, Y-sections were employed where their material efficiency outweighed the added cost of connection details.

In tests for over-all material efficiency, the weight ratio of the aluminum tower to similar steel towers designed for the same loads was found to be in the order of 1:3. Low fabricating cost was achieved by the Alcoa fabricating plant at Cressona, Pa., where it was determined that the special Y-sections are no more difficut to work with than are the standard angles.

Alcoa was asked to participate in the EHV Project because the unique properties of aluminum are well adapted for use in transmission towers, as well as in substations and related structures. The utility industry's interest in aluminum centers around the metal's resistance to corrosion, which allows maintenance-free operation, and the metal's light weight, which facilitates handling. Its resistance to corrosion has made aluminum especially acceptable for installations in industrial areas and seacoast atmospheres.

**Table I—Tower No. 4 Ultimate Design Stresses in Psi**

| | |
|---|---|
| **Tension-Stress** | 35,000 psi |
| **Compression-Stress** | 35,000 psi max. |
| In Columns: | |
| For $\frac{L}{R} < 63$, | $38{,}300 - 202\frac{L}{R}$ |
| For $\frac{L}{R} > 63$, | $\frac{102{,}000{,}000}{\left(\frac{L}{R}\right)^2}$ |
| In Legs of Angles and Y's: | |
| For $\frac{B-T}{T} < 12$, | $38{,}300 - 1{,}040\frac{B-T}{T}$ |
| For $\frac{B-T}{T} > 12$, | $\frac{3{,}870{,}000\,T^2}{(B-T)^2}$ |

Limiting Values of $\frac{L}{R}$ for Compression Members:

| | |
|---|---|
| Corner Posts, Crossarm Chords | —120 |
| Web Members, Stress Computed | —150 |
| Web Members, Stress Not Computed | —200 |

$\frac{L}{R}$, slenderness ratio, is ratio of length to least radius of gyration.
B is width of leg
T is thickness of leg

**Bolt Stresses**

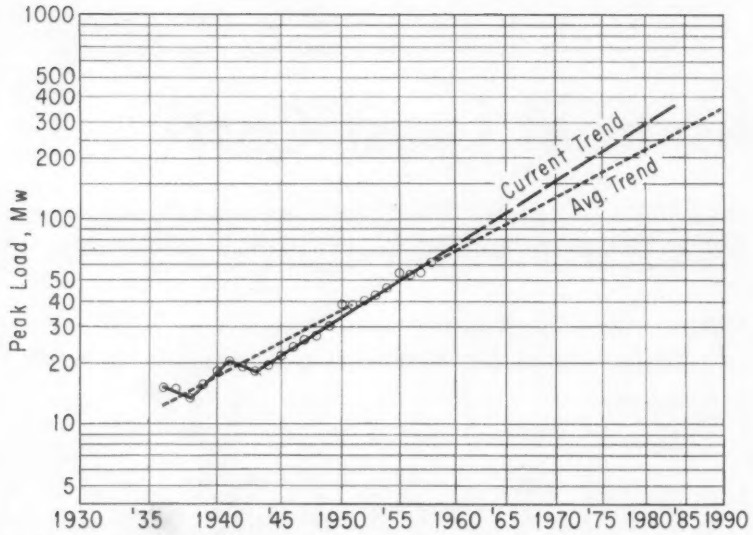
Shear—24,600 psi

| Edge Distance | Bearing Stress |
|---|---|
| 2D | 53,300 psi |
| 1.75D | 48,000 psi |
| 1.5D | 45,500 psi |

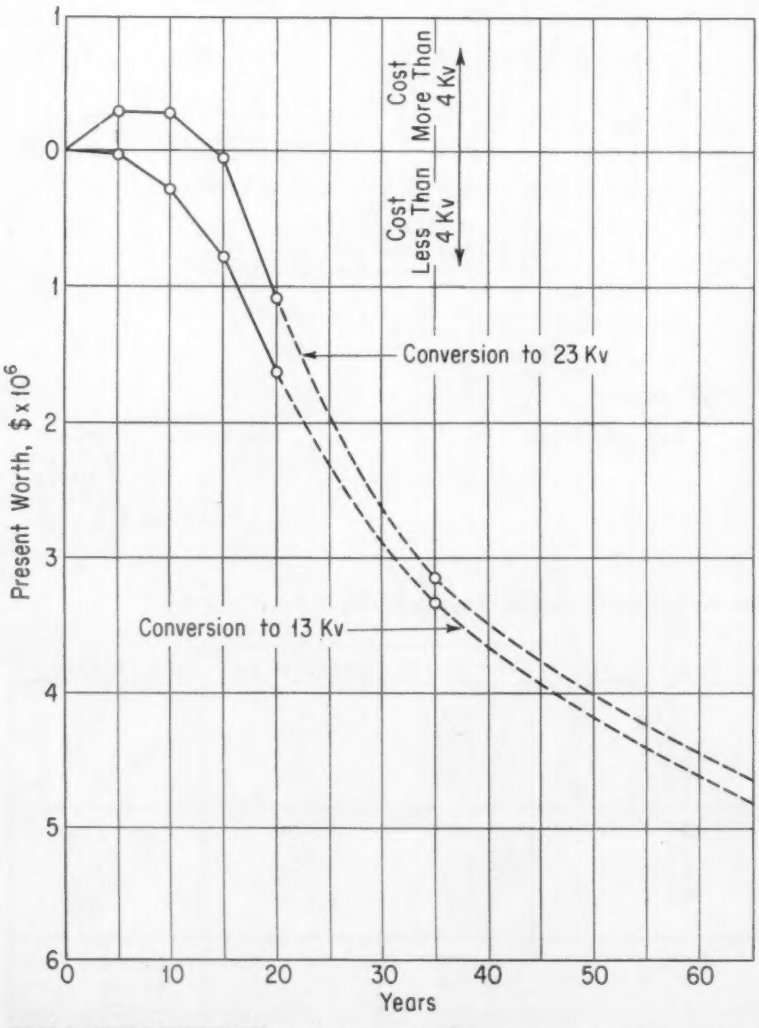
where D is bolt dia, in.

**Table II—Ultimate Cable Loads in Lb**

| Case | Cable | Phase Spacing, Ft. | Vertical | Transverse | Longitudinal |
|---|---|---|---|---|---|
| T1-A | 2 Plovers | 38.5 | 18,400 | 4,400 | - - - - |
| T1-B | 3 Plovers | 45.5 | 26,600 | 6,600 | - - - - |
| T1-C | 4 Cardinals | 45.5 | 26,400 | 7,900 | - - - - |
| T1-ABC | 1 Static | 62.0 | 3,800 | 1,500 | - - - - |
| T4-A | 2 Plovers | 38.5 | 7,300 | 5,800 | - - - - |
| T4-B | 3 Plovers | 45.5 | 10,400 | 8,600 | - - - - |
| T4-C | 4 Cardinals | 45.5 | 9,400 | 9,400 | - - - - |
| T4-ABC | 1 Static | 62.0 | 1,100 | 1,400 | - - - - |
| T5-A | 2 Plovers | 38.5 | 6,400 | - - - | 4,500 |
| T5-B | 3 Plovers | 45.5 | 9,100 | - - - | 4,500 |
| T5-C | 4 Cardinals | 45.5 | 8,300 | - - - | 4,500 |
| T5-ABC | 1 Static | 62.0 | 1,000 | - - - | 4,000 |




**LOAD GROWTH** in Stamford area shows average trend and projected current trend. Latter, chosen for study, shows quadrupling in 20-25 years




**CUMULATIVE DIFFERENCES** in present worth of net charges were taken to 'one lifetime' (65 years) in determining economic choice of voltage

# Area Study

## Existing 13-kv subtransmission has an advantage over 23 kv; conversion cheaper when started at bulk supply instead of fringes

The choice of 13 kv in preference to 23 kv or the continuation of existing 4 kv was determined through a detailed study for distribution in Stamford, Conn. This town has light industrial and commercial loading, a town-center concentration of multi-family dwellings and a broad area of single-family residences. Conversion to either of the higher voltages was shown more economical than continued expansion of the 4.16 kv over the coming 20-25 years. Because 13.2 kv is the subtransmission level for supplying 4-kv distribution substations in Stamford, this proved cheaper than the higher voltage.

The study also investigated the order in which to convert areas and showed it was most economical to start with the high-load-density areas in the civic center, which is also the site of the major bulk stations supplying Stamford. This would have been true also for 23 kv.

Load growth in the area is shown by the trend lines above. The current-trend line extended for this study showed a peak four times that of the study year after 20-25 years. The 1960-61 winter peak was 65,000 kva on the 4-kv distribution and 23,000 kva on the 13-kv network and services.

Six 13-kv circuits out of Electric Station and six out of Glenbrook Substation fed 24 substations distributing at 4 kv. These 24 substations served areas one-half to six square miles in size, all well within reach of the substation sites at this voltage. However, ten of the 24 permitted no expansion, and suitable new sites were becoming increasingly hard to acquire.

Cost comparisons for a 20-year period for the three voltages covered these items:

• **4 kv:** Distribution line and distribution transformer additions; re-

Based on report by Research & Planning Dept, Hartford Electric Light Co.

# Favors 13-Kv Distribution Conversion

located, expanded and new distribution substations; subtransmission lines and bulk station switch positions, bulk capacity additions and bulk stations at new locations; transmission additions to feed the bulks

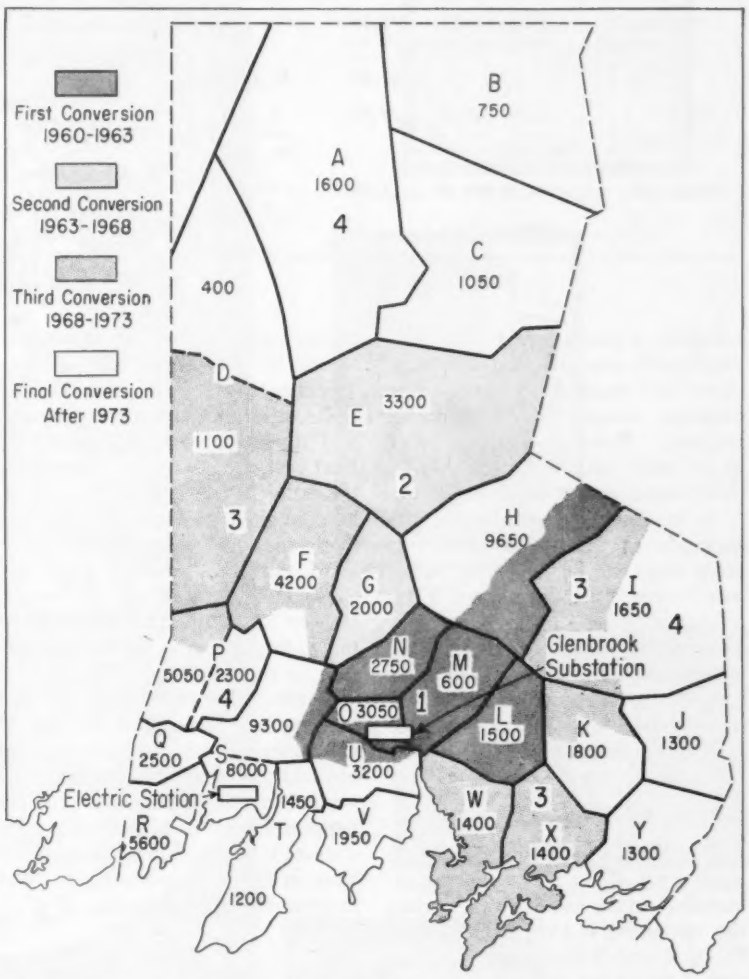
• **13 kv:** Additions for converting the entire 4-kv distribution plant to 13 kv over 20 years, with conversion rate the first 15 years such that the reusable 4-kv equipment released each year exactly meets the expansion requirements of the plant remaining at 4 kv; continuation costs of 4-kv plant not yet converted

• **23 kv:** Same as for 13 kv except that the secondary network supply and certain large customer services would remain at 13 kv.

Common to all three alternatives were normal conversions and additions to the 13-kv supplying the network and conversion of existing series street lighting to multiple.

Major plant additions were entered in their scheduled years on specific cost estimates. Other distribution additions were calculated on a five-year basis and distributed uniformly over each five-year period. Plant removals were entered for major items, while other reused items were credited. The comparison included all electric plant additions except generating plant.

Savings in energy losses at the two higher voltages as compared to 4 kv were entered as credits to expense. Present worths of annual charges were taken to "one lifetime" to determine the economic choice of schemes. One lifetime as used here is defined as the age of the last survivor of equipment installed during the period of firm estimate plus the length of the estimating period, 45 + 20 = 65 years.




**LOADS** in delineated areas of Stamford varied from 400 to 9,650 kva in study year. Shaded areas show 4-step order of conversion from 4 kv to 13kv

### 4-Kv Criteria

At 4 kv, the capability of each existing substation was determined as either the number of existing feeders times the maximum load of 1,800 kva each or the ASA capability of transformers for ½% loss of life, whichever was less. Transformer and feeder capacity needed to meet growth in each area during each five-year period was added in blocks of 1,800-kva capability. Where adjacent areas could share a capacity addition temporarily, such a load transfer was effected. New substations were added where needed and logical area reassignments made.

Distribution transformer additions were made on the basis of the projected load increment for each five-year period. The added kva was determined on the same demand factor as that for the study year. The cost per kva added varied with the density of each area, as will be shown. Again, the cost per period was divided by five and spread uniformly over that period.

Subtransmission lines at 13 kv were added, generally for 8,000 kva per circuit, over logical routes to serve projected load growth. Their costs included breakers at bulk stations. Bulk station capacity additions were made when the projected diversified sum of the assigned loads reached the ASA capability of the existing equipment. New bulks were established as the capacities of existing bulks were approached. These were added item by item at the years indicate by the study.

### 13-Kv Considerations

For 13-kv conversion, mains were established by reconductoring to 336.4 MCM AAC, and branches from them were converted for 1,800 kva each without replacing the ex-

**Distribution Loss Savings of 13 and 23 Kv Over 4 Kv**

| | Losses in Kw | Annual Cost | Annual Cost per Kva |
|---|---|---|---|
| 4 Kv (load)..... | 1,671 @ $44.00 | $73,500 | |
| (no load).. | 218 @ $65.00 | 14,200 | |
| | | 87,800 | $1.53 |
| 13 Kv..... | 402 @ $44.00 | 17,700 | −0.31 |
| | Saving at 13 Kv | | $1.22 |
| 23 Kv..... | 100 @ $44.00 | 4,400 | −0.08 |
| | Saving at 23 Kv | | $1.45 |

**Net Transformer Conversion Cost, 4 Kv to 13 Kv**

| | |
|---|---|
| Cost of 13-kv transformer..... | $140 + 12.2 per kva |
| Installation cost..... | 76 |
| Sum..... | 216 + 12.2 per kva |
| Value of 4-kv transformer..... | 100 + 10.0 per kva |
| Difference..... | 116 + 2.2 per kva |
| Cost of removal @ $76 × 60%..... | 46 |
| Net conversion cost per transformer..... | $162 + 2.2 per kva |

isting No. 4 conductors. Each 1,800-kva branch was provided with a recloser and manual tie switch to an adjacent circuit for emergency transfer. Reactors were provided at the bulk stations for each 13-kv distribution circuit established.

Substation requirements for continuation of the unconverted 4-kv areas were met by relocating equipment released by conversions. Likewise, additional 13-kv subtransmission requirements to the unconverted but growing 4-kv areas were met by the relief provided by the new 13-kv conversions. Transmission and bulk station additions were the same as for 4-kv continuation.

### Criteria for 23 Kv

The 23-kv plan converted the same areas as the 13-kv scheme except that, in the last five-year period, the remaining 4-kv plant in areas P, Q, R and S (see map) was converted to 13 kv instead of 23 kv. Certain large customers and the network supply were kept on 13 kv, as mentioned.

The loss savings each year for both conversions were computed as the product of the cumulative kva of converted areas and a loss savings factor. This factor, $1.22 per kva per year at 13 kv and $1.45 at 23 kv, is the savings per annual kva of demand made by conversion. These were computed as above (box).

The cost per kw of losses in the above table was based on generation demand charge of $30 per kw and energy charge of 4 mills per kwhr. Loss factor of load losses is 38.8%. The losses in future years were assumed to bear the same relation to total load as that for the study year. This simplified treatment comes within 2% of the results obtained by a rigorous and complex solution.

Because the aim of conversion was to provide added capacity at least cost, the study also determined the order in which the areas should be converted. Essentially, this was from the load concentration outward, as the map shows. The study showed the per-kva cost of conversion to 13 kv by areas and showed this to be cheaper as the load density rose, as the graph below shows.

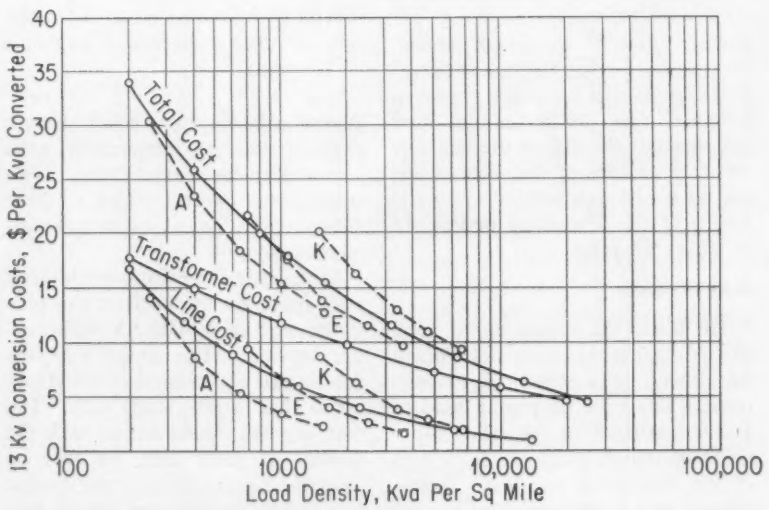
Further, the sufficiency of the existing subtransmission circuits to the outer substations is enhanced by each relief made through conversion nearer the source. It also happened that, in general, the substations least adaptable to expansion were in the heavier-density areas at or near the bulk stations.

Estimates of conversion cost per kva were made separately for transformer and line conversions. The transformer conversion cost was taken as the installed cost of the new 13-kv transformer minus the value of the reusable 4-kv one, plus its removal cost, as above (box).

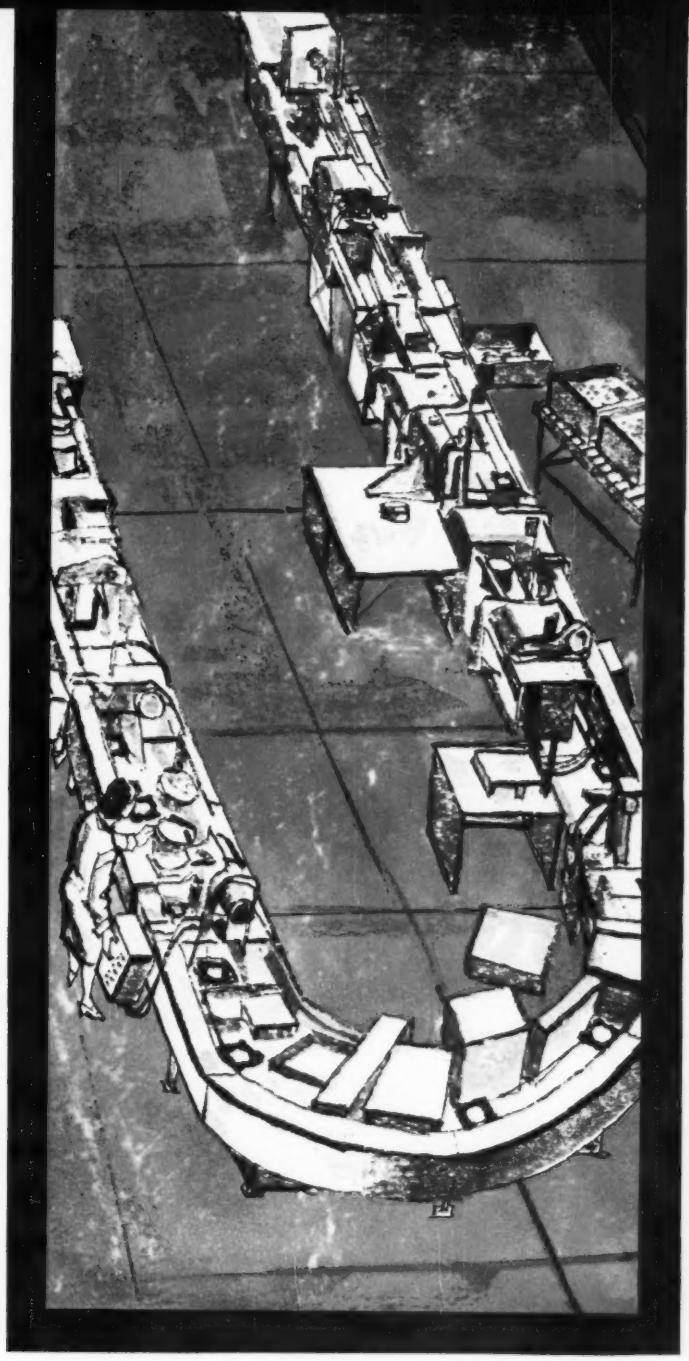
Then the total for an area was found by multiplying this net cost by the number of transformers and their total nameplate kva.

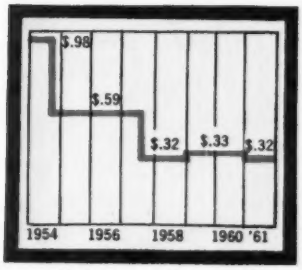
In figuring line conversion costs, these factors entered:

- Because it was assumed that all new lines would be of high-voltage design whether conversion has taken place or not, future line conversion costs per area were taken the same as for the study year.
- Cost of protective equipment was omitted as unnecessary to establish the relations sought.

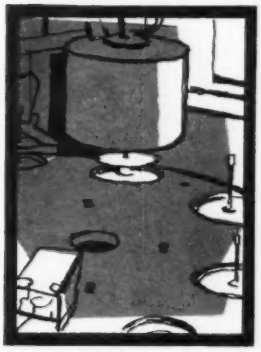



**CONVERSION COST** was shown to become cheaper as load density rises. Dotted lines are for individual areas marked with same letters on map

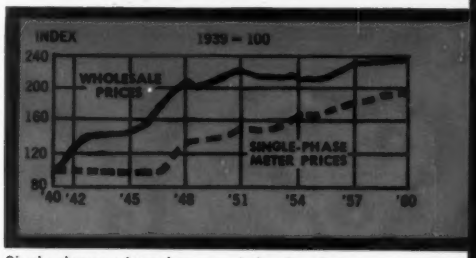





Single-phase meter prices per KVA of meter capacity



Rotary turntable used to magnetize inner suspension magnet on disk-shaft




Single-phase meter prices vs. wholesale prices

Die-cast worm gear to shaft in single automated operation

ANOTHER GENERAL ELECTRIC METERING EXTRA . . .

# How automation helps keep meter prices low

The electric utility industry might have paid an additional $400 million for watthour meters during the last 21 years if meter prices had increased at the same rate as the 2000 other commodities on the government wholesale price index (see chart above).

Instead, meter prices have remained relatively stable in spite of rising material and labor costs. As recently as 1954, the price of a standard, 3-wire residential-type, single-phase meter, per KVA of meter capacity was 98¢; today, it has been reduced to 32¢ (see chart above); in 1923, the price per KVA was $20.35.

General Electric's integrated automation and other cost-reducing programs —aimed at offering maximum value for the customer's meter dollar—have been prime factors in helping keep meter prices low. Design leadership through magnetic-suspension, and quality leadership through certified accuracy, performance and reliability also contribute to maximum meter value. Get the complete "Meter Price Story" from your General Electric Sales Engineer. 713-13

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- Low Cost per KVA
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- Product Service
- Load Building Programs
- Industry Communication
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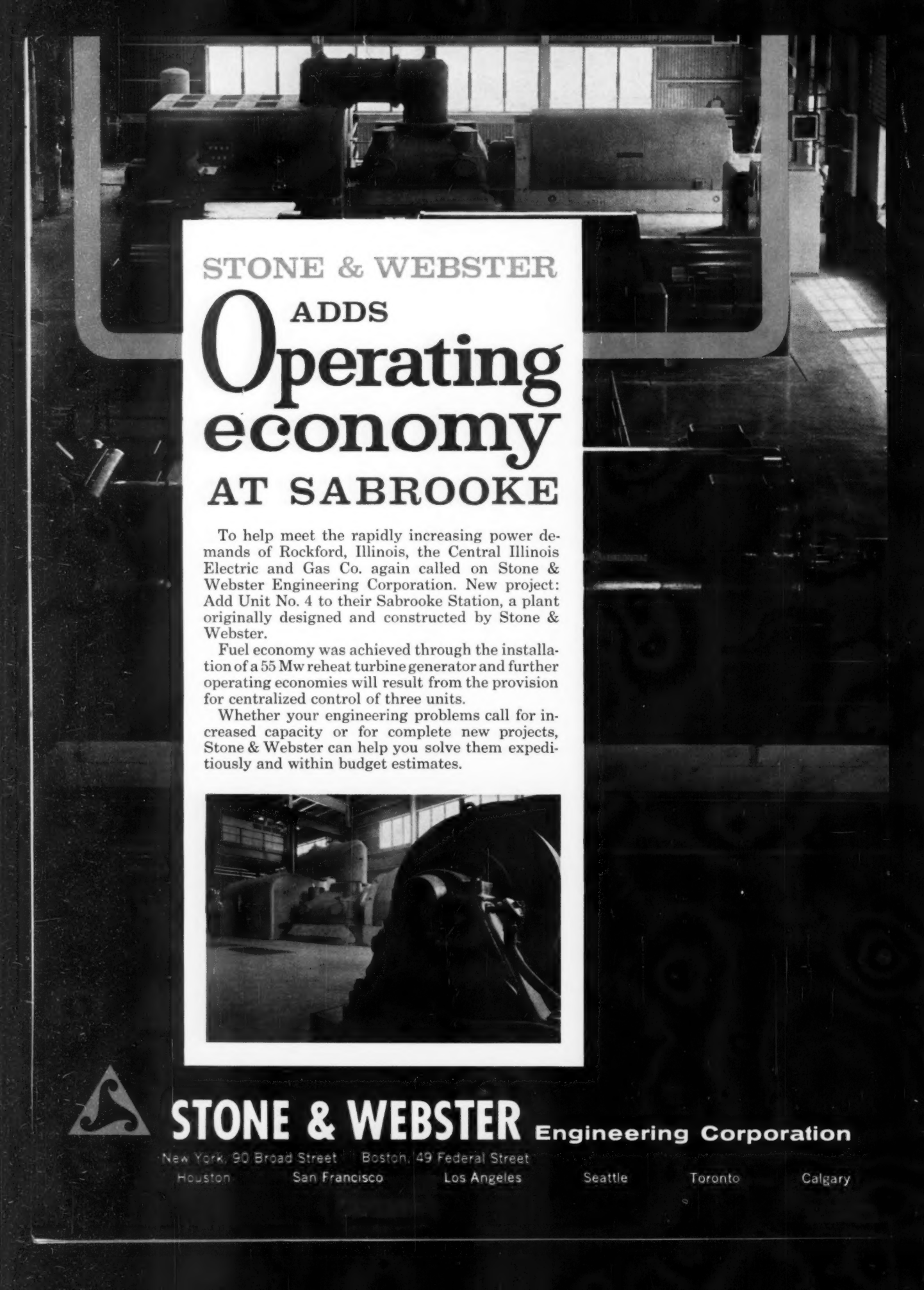
GENERAL ELECTRIC



STONE & WEBSTER

# ADDS Operating economy AT SABROOKE

To help meet the rapidly increasing power demands of Rockford, Illinois, the Central Illinois Electric and Gas Co. again called on Stone & Webster Engineering Corporation. New project: Add Unit No. 4 to their Sabrooke Station, a plant originally designed and constructed by Stone & Webster.

Fuel economy was achieved through the installation of a 55 Mw reheat turbine generator and further operating economies will result from the provision for centralized control of three units.

Whether your engineering problems call for increased capacity or for complete new projects, Stone & Webster can help you solve them expeditiously and within budget estimates.



**STONE & WEBSTER** Engineering Corporation

New York, 90 Broad Street Boston, 49 Federal Street

Houston San Francisco Los Angeles Seattle Toronto Calgary

Electrical World Report

SEPTEMBER
OCTOBER

1961

# ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE

**Suspend Live Gang-Operated Air-Break Switch to Replace Pole**
H- frame supports live 12-kv line and gang-operated air-break switch, permitting Carolina P&L to replace pole in 2½ hours — p 67

**Chemical Toxics Injected Into Redwood Eliminate Decay**
Eight-year testing shows that pressure-injecting toxic chemicals into seasoned tower redwood cuts maintenance costs — p 68

**Gain 10,000 Wood Poles at 60% Savings**
Northern States Power reclaims 10,000 obsolescent poles during eight years at about 40% of new pole costs — p 70

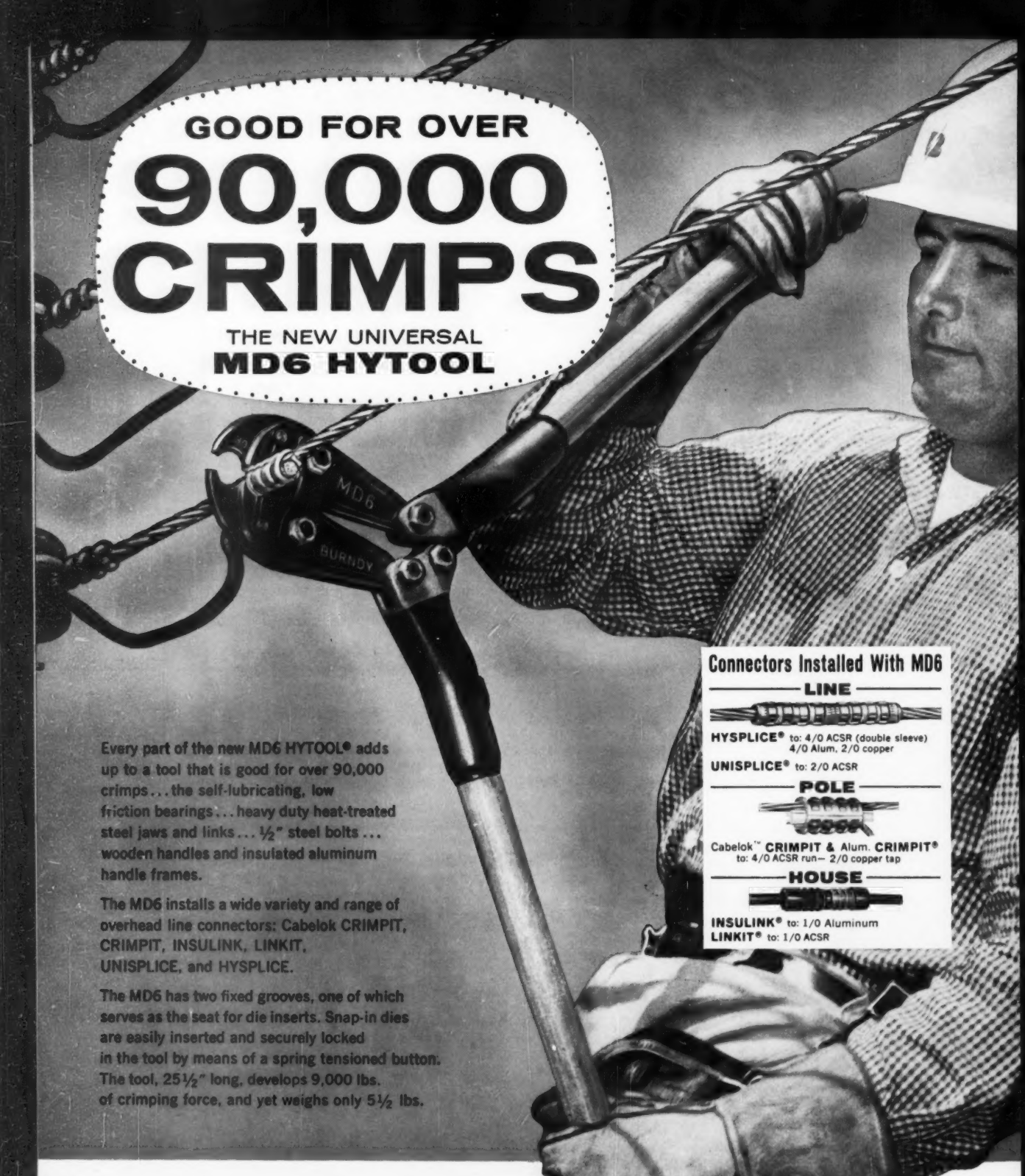
Regular Departments

Construction — p 74
Operation & Testing — p 82
Maintenance & Repair — p 88
Stores & Shops — p 94
Safety — p 96

New Equipment — p 55
Manufacturers Literature — p 98

# GOOD FOR OVER 90,000 CRIMPS

THE NEW UNIVERSAL
**MD6 HYTOOL**




Every part of the new MD6 HYTOOL® adds up to a tool that is good for over 90,000 crimps... the self-lubricating, low friction bearings... heavy duty heat-treated steel jaws and links... ½" steel bolts... wooden handles and insulated aluminum handle frames.

The MD6 installs a wide variety and range of overhead line connectors: Cabelok CRIMPIT, CRIMPIT, INSULINK, LINKIT, UNISPLICE, and HYSPLICE.

The MD6 has two fixed grooves, one of which serves as the seat for die inserts. Snap-in dies are easily inserted and securely locked in the tool by means of a spring tensioned button. The tool, 25½" long, develops 9,000 lbs. of crimping force, and yet weighs only 5½ lbs.

## Connectors Installed With MD6

**LINE**



**HYSPLICE®** to: 4/0 ACSR (double sleeve) 4/0 Alum. 2/0 copper

**UNISPLICE®** to: 2/0 ACSR

**POLE**



Cabelok™ **CRIMPIT** & Alum. **CRIMPIT®** to: 4/0 ACSR run– 2/0 copper tap

**HOUSE**



**INSULINK®** to: 1/0 Aluminum
**LINKIT®** to: 1/0 ACSR

*for major compression developments look to...*

# BURNDY

60 17

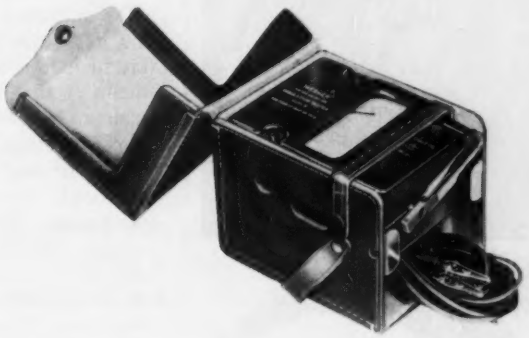
NORWALK, CONNECT. BICC—BURNDY Ltd. Prescot, Lancs., England In Continental Europe: Antwerp, Belgium TORONTO, CANADA

CIRCLE 54 ON READER SERVICE CARD

## Insulation Tester . . .

**. . . features a constant-voltage hand generator,** making it always ready to use. Mark III, pocket-size Megger unit, keeps testing voltage and readings steady through its special limiting circuitry design— obviating the need for a constant-speed device or a voltage stabilizer. Three ranges are available: 100-v dc, 0.02 to 20 megohms; 250-v dc, 0.05 to 50 megohms; and 500 v-dc, 0.1 to 100 megohms. All models have a double scale and selector switch for 0 to 10,000 ohms. The optional camera-type leather case offers maximum protection for the instrument in severe field service and stores the leads under the test set.

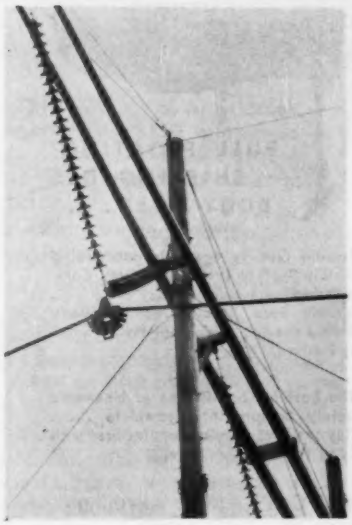
**James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa. (1)**

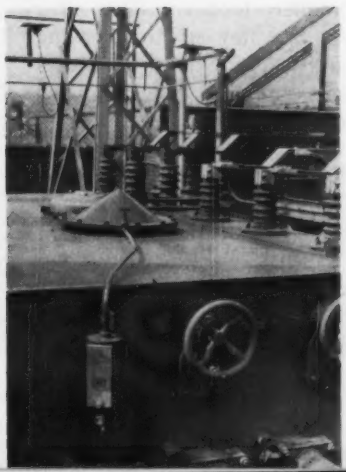


## Stringing Block . . .

**. . . designed for large, single conductors** ordinarily requiring heavy, conventional blocks, provides large effective sheave diameter—yet is about one-third the weight of the conventional single-sheave block. The flowing-arch-groove conductor stringing block reportedly is easier to handle because, although it has a 42-in. effective sheave diameter, its over-all length including frame is only 30 in. The block is made up of 17 separate segments which ride on two ball-bearing rollers to form an arch which supports the conductor. Result is a 40-deg included sheave section.

**Sherman & Reilly, Inc, First & Broad, Chattanooga, Tenn. (2)**





## Water/Acid Condenser . . .

**. . . reduces deterioration of transformer oil,** maintains dielectric strength and retards corrosion in both free-breathing and modern sealed units. Condensaire equipment for condensing and removing water and volatile acids consists of a metallic, inverted cone-shaped hood assembly which can normally be bolted on the existing hand-hole cover boss. A heavy gasket insulates this conical hood from the main transformer cover so that the hood is always cooler than the main cover. Condensaire equipment can be added to any transformer where space and facilities will permit.

**Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. (3)**

*(More New Equipment on page 56)*

*Bashlin's Quality*

FOR OVER 30 YEARS
Choice of Experienced Linemen

FULL FLOATING SHIFTING DEE BODY BELT . . .

Bashlin Quality again is outstanding in this "safety first" body belt. Comfortable, with tools in easy reach . . . Doubly Safe because Bashlin Body Belts have the additional Nylon Safety Feature.

The Bashlin Quality Line of Linemen's Safety Equipment is complete . . . Buy the best from a manufacturer with Long Proven Experience.

You Can't Afford Anything LESS Than the BEST—
*Buy* **BASHLIN**
Highest Quality For Over 30 Years

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EXPORT: Copperweld Steel International Co. IN CANADA: A. B. Chance Co. of Canada Ltd., Toronto

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CATALOG NO. 456

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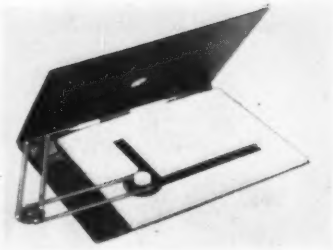


## Sketch Kit . . .

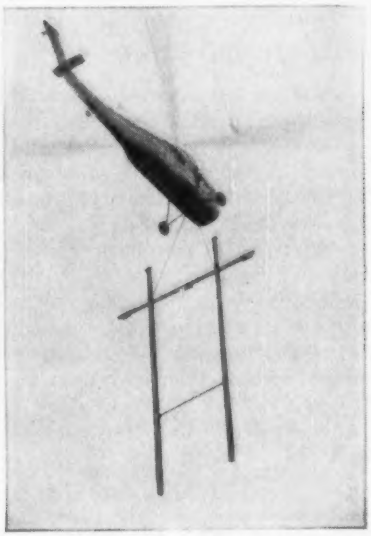
**. . . features portable drafting machine** mounted in vinyl, self-locking binder. Draftette portfolio fold kit includes the drafting instrument, with 3x5-in. or 4x6-in. scale and 180-deg protractor, pad of 50 sheets of 8½x11-in. drawing paper and pencil. Made of anodized aluminum, with one-piece scale, it is a combined T-square, triangle and protractor. All parts of the instrument are machine-calibrated. The kit measures 9½x13x1½ in. **(4) Draftette Co, Beverly Hills, Calif.**

## Safety Helmet . . .

**. . . is injection molded** with polycarbonate, new high-impact thermoplastic. New line of Shockgard Mark II is said to combine unprecedented impact and penetration resistance with high dielectric strength. Each safety hat and cap complies with dielectric tests of Edison Electric Institute Specification AP-1 1961, retaining high dielectric strength under severe impact at temperatures ranging from —100 to 270F. Lightweight and de-

*(Continued on page 60)*


Here is
**PROGRESS**
in Pole Line
Construction



**PROGRESS**
is important in
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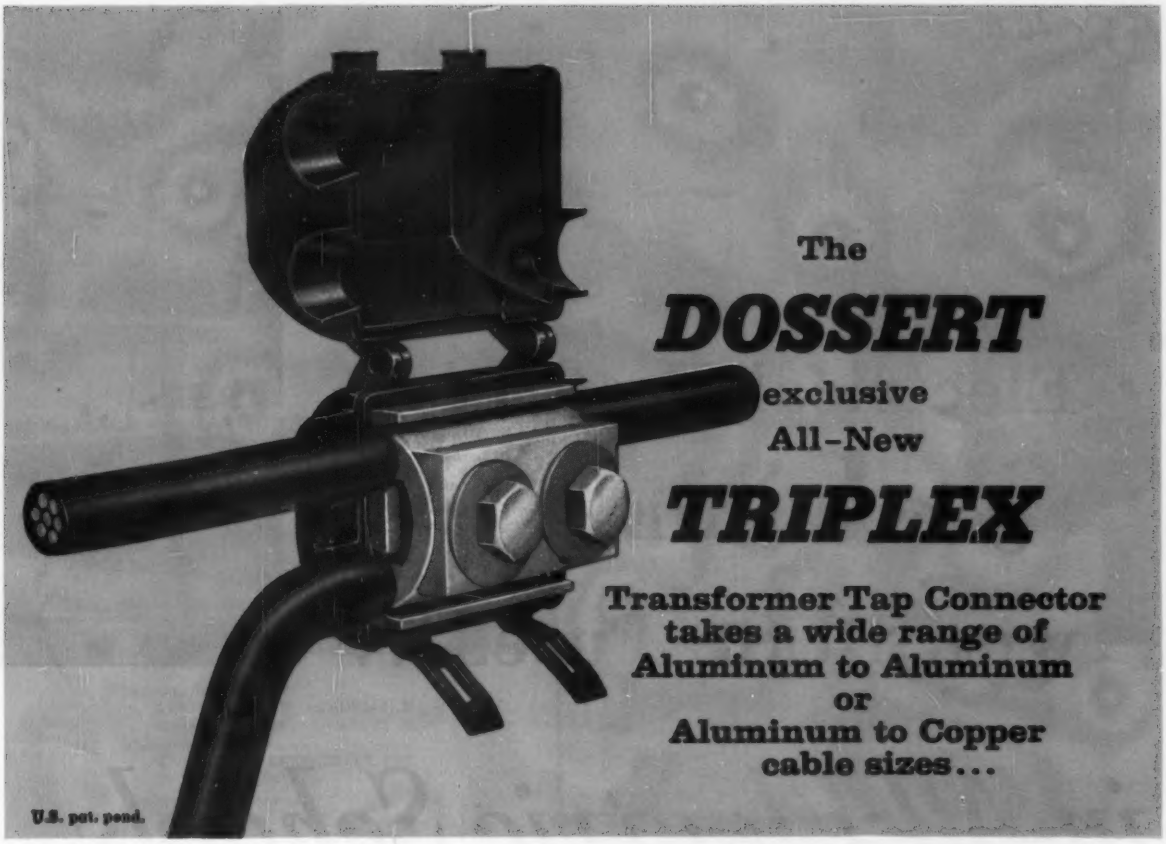
*— Pentachlorophenol Treated —*

Our ultra-modern plants offer you the newest in treating facilities, fabricating equipment, storing, handling and shipping service.

**3 strategically located yards at Bellingham, Washington Minneapolis, Minnesota and Findlay, Ohio.**

**R. G. HALEY & CO., INC.**
Spitzer Bldg., Toledo 4, Ohio



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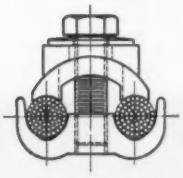
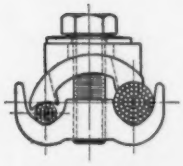
# The DOSSERT exclusive All-New TRIPLEX

## Transformer Tap Connector takes a wide range of Aluminum to Aluminum or Aluminum to Copper cable sizes...





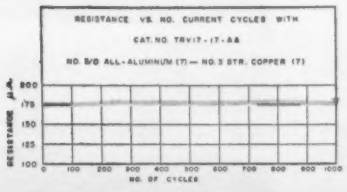
. . . in both grooves, because it is self-leveling. The TRIPLEX line of transformer tap connectors is the final result of intensive research by DOSSERT engineers. The TRIPLEX combines the efficient electrical properties of a parallel groove clamp along with a high dielectric strength polyethylene insulating cover to form an easy-to-install, completely insulated connector.

The TRIPLEX (type TRV) incorporates several unique features, that attribute to its high strength and extremely stable electrical characteristics.

**1.** A tangential plate, that receives the bolt clamping pressure and redistributes it uniformly over the arc of the clamping cap.

**2.** The tangential plate also establishes a flat surface perpendicular to the axis of the bolt for any combination of cable sizes. Perpendicularity is maintained even with connector holding a maximum cable in one groove and a minimum in the other.

**3.** To assure full clamping pressure during the thermal change caused by varying electrical loads, the connector has dish-shaped Belleville spring washers under the head of each bolt that permit expansion or contraction of the connector with constant spring loaded pressure on the clamping members.




### TRIPLEX heat cycling test shows negligible change in resistance!

An established current level of 330 amperes drove the conductors to a minimum temperature of 125°C. The on-time was 20 minutes and the off-time 40 minutes. The curve shows negligible resistance change throughout the entire 1000 cycles.

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50 YEARS OF TECHNICAL KNOW-HOW

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# Electrical Protection goes MODERN with BUSS Fuses...

# *in All-Electric Schools*

## *Utica Michigan*

● *Electricity* heats, lights, pumps water, cooks and operates all motor driven equipment in the West Utica and the Ewell Elementary Schools. No other utility service is used except the telephone.

The complete use of electrical energy puts special emphasis on the need to use the safest, most modern protective devices throughout the electrical system.

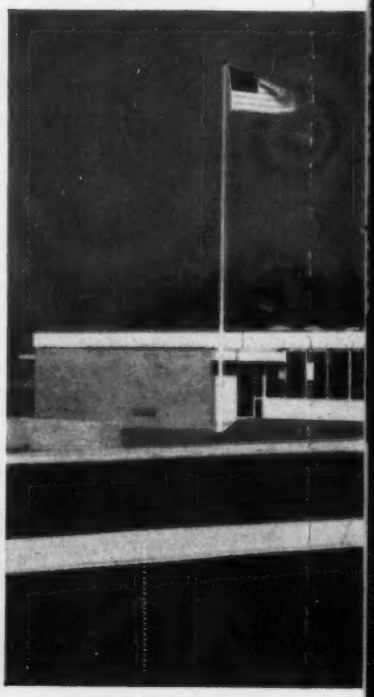
In each school, the main switchboard is protected by 3—1600 ampere BUSS Hi-Cap fuses having an interrupting rating of 200,000 amps. rms symmetrical. Thus, safe interruption of fault currents now available is assured,—and the fuses are adequately safe to allow for future system growth.

If a high fault current should occur, the fast opening characteristics of BUSS Hi-Cap fuses further protect the circuits and equipment against damage by restricting let-thru fault currents to safe value.

*Feeder and branch circuit protection*

To provide the safest short-circuit and overload protection . . . and to prevent needless outages,—FUSETRON dual-element fuses are used in the feeders and branch circuits of these schools.

For modern, all-purpose protection of circuits up to 600 amps., FUSETRON fuses cannot be equalled. They have 100,000 amp. interrupting capacity,—and sufficient time-lag to hold harmless overloads.

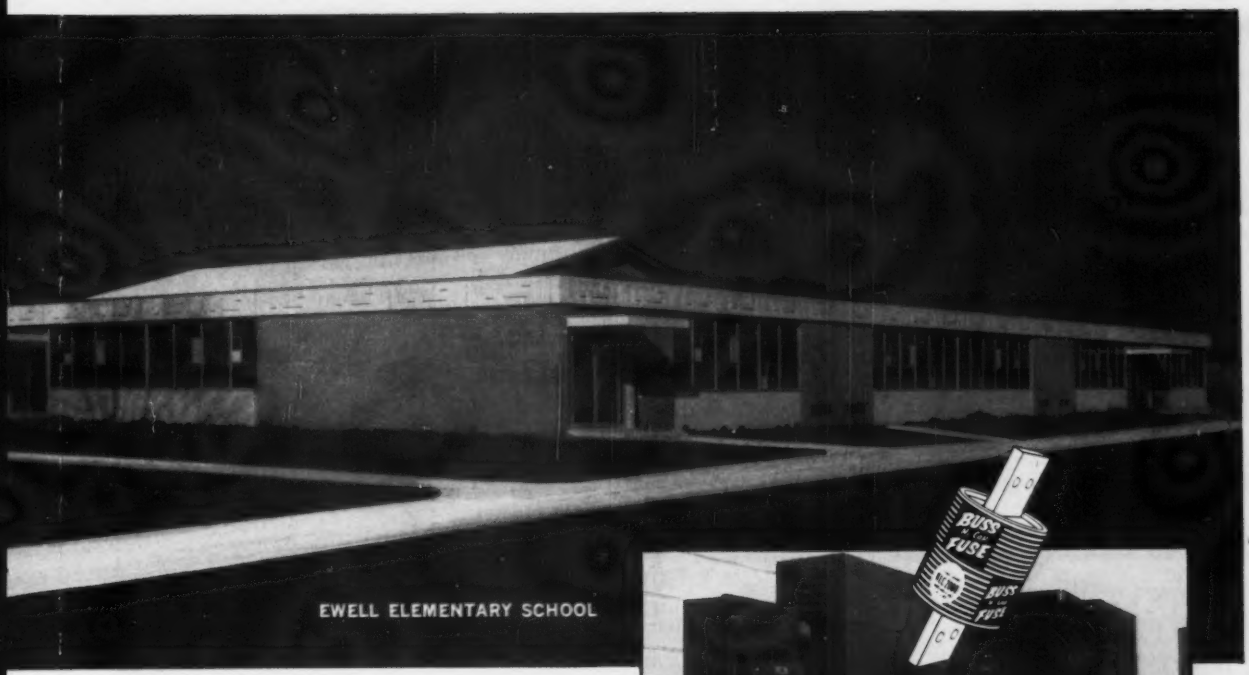


*For more information on*

**FUSETRON dual-element fuses** *. . . write for bulletin FIS*

**BUSS Hi-Cap fuses** *. . . write for bulletin HCS*

**BUSSMANN MFG. DIVISION,** *McGraw-Edison Co.* **St. Louis 7, Mo.**



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**Switchboards protected by BUSS Hi-Cap and FUSETRON dual-element fuses.**

1061

WEST UTICA SCHOOL

KEEP PACE ELECTRICALLY




*with Safety!*

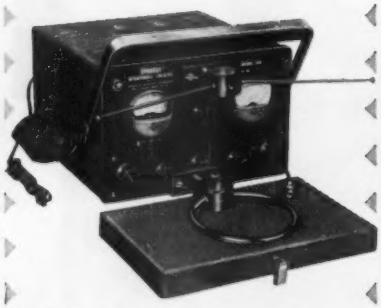


CIRCLE 59 ON READER SERVICE CARD

# SPRAGUE®

## MODEL 500 INTERFERENCE LOCATOR

LOCATE rf NOISE SOURCES QUICKLY



This versatile instrument is a highly sensitive interference locator—*with the widest frequency range of any standard available unit!* Model 500 tunes across the entire standard and FM broadcast, shortwave, and VHF-TV spectrums from 550 kc. to 220 mc. in 6 bands.

It's a compact, portable, rugged, versatile instrument—engineered and designed for most efficient operation *in practical field use.* It features a transistorized power supply, meter indications proportional to carrier strength as well as sensitivity of 5 microvolts minimum for 5% meter deflection over entire tuning range.

For full details, send for brochure IL-106.

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**SPRAGUE®**
*THE MARK OF RELIABILITY*


signed with single-ridge construction to help deflect the force of a falling object, the new headgear also complies with Federal Specification GGG-H-142b and specifications of American Standards Assn. Crown suspension design is double cradle, with upper cradle fixed permanently for built-in safety margin, lower cradle adjustable to wearer.
**Mine Safety Appliances Co, Pittsburgh, Pa. (5)**

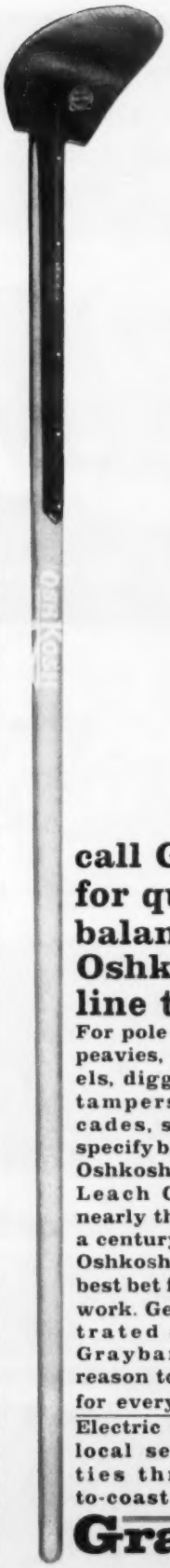
## Wedge Clamp . . .

**. . . all-aluminum, dead-ending,** has nylon-jacketed, galvanized steel flexible bail which is said to be extremely resistant to weathering and corrosion. The clamp resists deterioration from ultra-violet radiation, moisture, temperature and has high abrasion and fatigue resistance. The nylon jacket is offered as standard equipment on all Blackburn flexible bail aluminum wedge clamps.
**Jasper Blackburn Corp, St. Louis, Mo. (6)**

## SRT Distribution Transformers . . .

**. . . are now available through 100 kva at 2.4 and 4.16 kv;** through 167 kva at 4.8 and 8 kv; through 250 kva at 7.2 and 7.62 kv; through 333 kva at 12

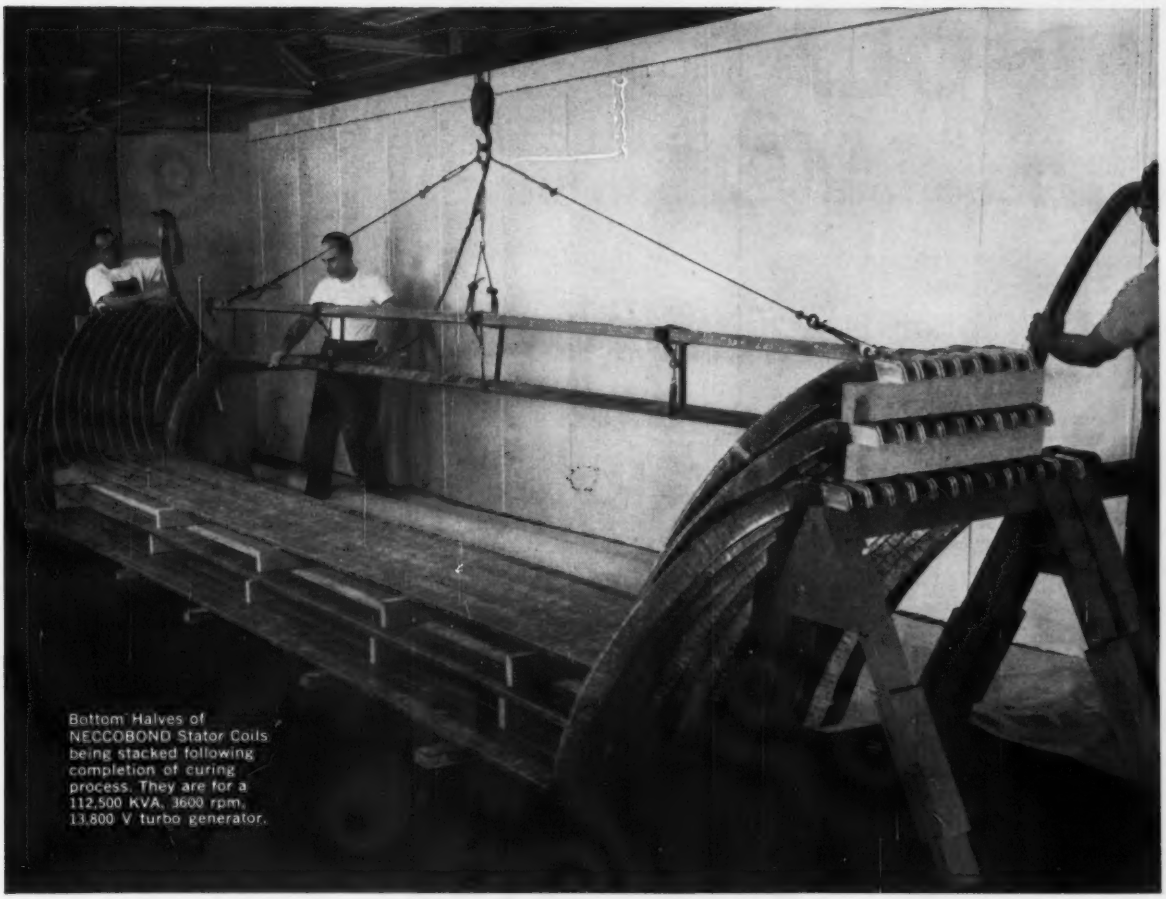
*(Continued on page 62)*




**call Graybar for quality-balanced Oshkosh pole-line tools**

**For pole cradles, hooks, peavies, carriers...shovels, diggers, ladders... tampers, reels, barricades, signs—always specify balanced, quality Oshkosh brand tools by Leach Co. Backed by nearly three-quarters of a century of experience, Oshkosh tools are your best bet for any pole-line work. Get 28-page illustrated catalog from Graybar. It's another reason to call Graybar—for everything. Graybar Electric Company, Inc.: local service to utilities through coast-to-coast warehousing.**

**GraybaR**



Bottom Halves of NECCOBOND Stator Coils being stacked following completion of curing process. They are for a 112,500 KVA, 3600 rpm, 13,800 V turbo generator.

*NECCOBOND INSULATED COILS OFFER*

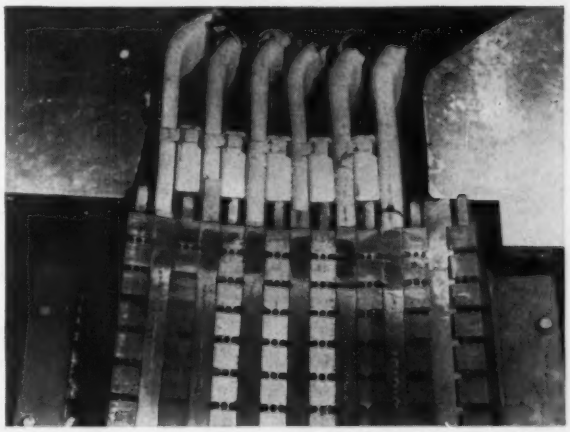
## FREEDOM FROM TAPE SEPARATION

Thorough tests have confirmed the ability of NECCOBOND insulated coils wound into a long core to withstand extensive temperature cycling without longitudinal migration of the mica at the ends of the slot.

The great mechanical and dielectric strength of the NECCOBOND insulation system, combine with its thermal stability and its ability to expand and contract as a unit with the copper to overcome this problem in longer core machines.

This very common cause of generator failure is permanently cured by the installation of NECCOBOND insulated stator coils.

National high voltage NECCOBOND insulation system is full Class B. It has excellent heat conductivity which is teamed with its high dielectric strength to permit more capacity or cooler operation of the generator. The low power factor of NECCOBOND insulation reflects the effectiveness of the filling of voids with the impregnating resin and freedom from corona problems of the coils in service. For information contact National's Columbus plant... HUdson 8-1151... or check the nearest National field engineer.



**Stator coils under test in a long core. Note the effect of extensive thermal cycling on the four stator coils to the right. Those unaffected to the left are NECCOBOND insulated.**

DIVISION OF

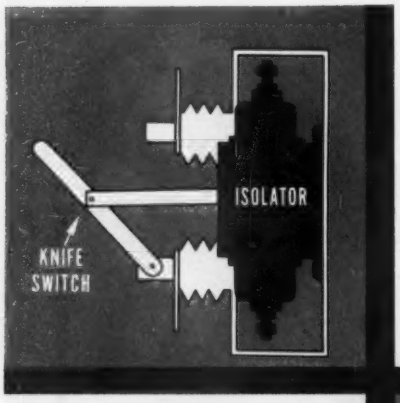
# National Electric Coil

COLUMBUS 16, OHIO • IN CANADA: ST. JOHNS, QUEBEC

McGRAW EDISON

# ISOLATORS

## are the most practical disconnect you can buy!

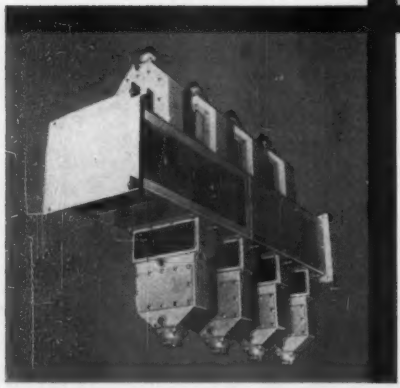



**Isolators require the least space of any disconnect**

. . . only ⅓ as much as an equally rated knife switch. ISOLATORS save on cubicle construction, floor space and installation time . . . lightweight, easy to install—come complete with all elements assembled in rigid frame.

**Isolators are safe!**

. . . the straight line action includes fool-proof protection. The insulating sleeve shields the live parts at all times and still shows a clearly visible gap when the switch is open.



**Isolators are versatile!**

. . . so compact, practical for switching centers that we've given a new name to a combination of bus duct and disconnect . . . the ISO-DUCT. Neat and handsome, excellent for both modern plants and replacements, ISOLATORS can be combined with potheads for any arrangement.

*Available from 5KV to 15KV in ratings from 600 to 2000 amp.*

**3E's famous straight line disconnect...now made by Kearney...is still unmatched in all important features**

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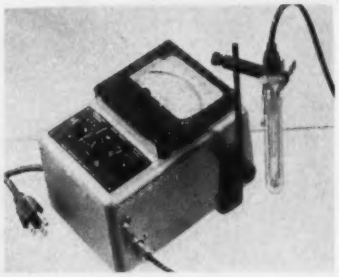
kv; through 500 kva at 14.4 and 20 kv. Rapid, snap-action, 40-amp tap changers are said to be assured through careful design of speed-controlling components. SRT's in both conventional and protected types are available with secondary ratings of 120/240, 240/480 and 277 v. Also, 2,400-v, 7,200-v and other high-voltage secondary units are offered for step-down applications.

**Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.** **(7)**



## Portable pH Meter . . .

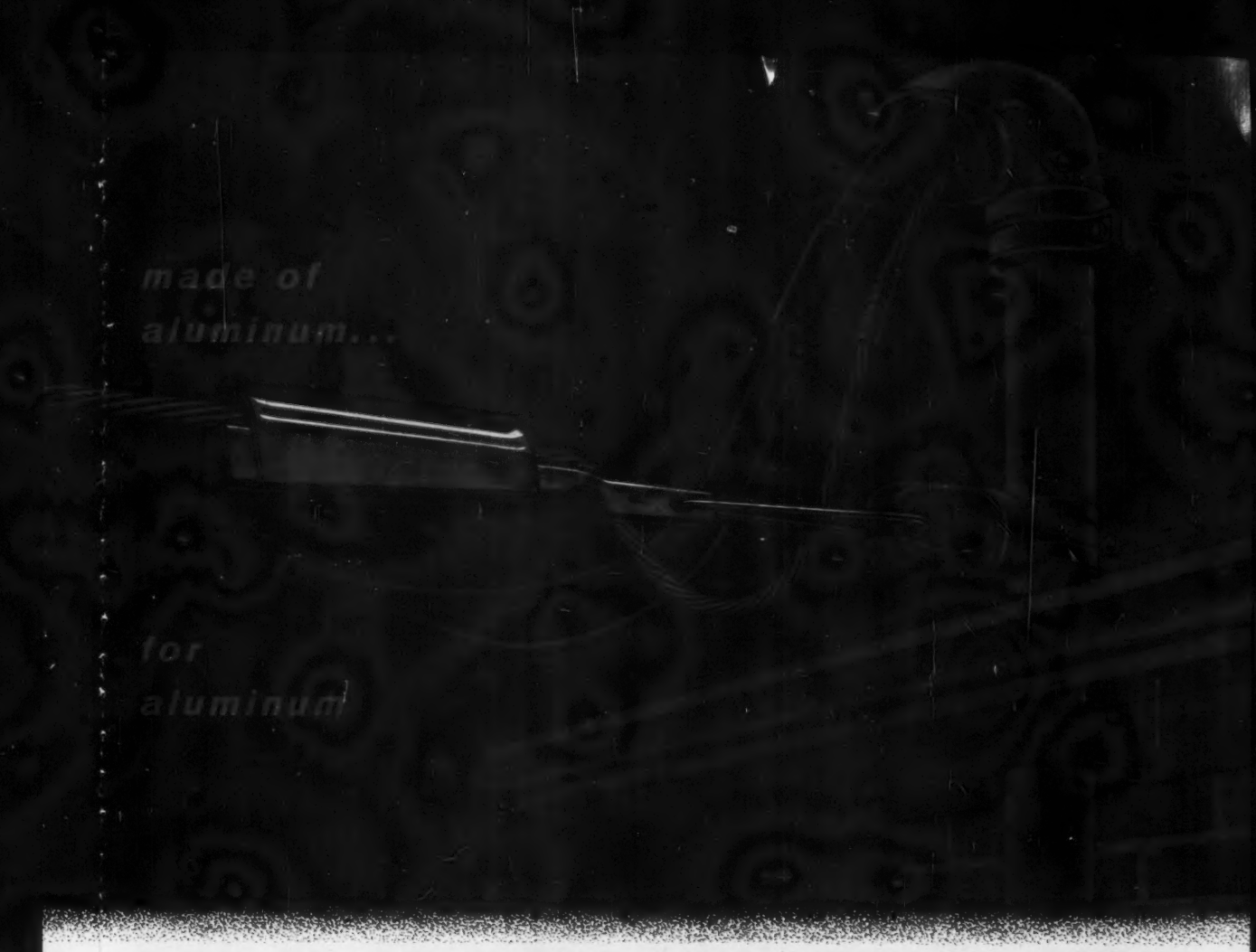
**. . . features a ±500-mv scale and a shock-resistant combination electrode.** Electrion II potentiometric model pH meter reportedly has the same high stability and gives the same precise, reproducible readings (with standardization once-a-week or less) as Electrion I. Accurate measurements from 0 to 14 pH at 15 to 70C are said to be obtained from the standard, full-range electrode. Several types of combination electodes, including those for high temperatures (up to 130C) also are available. Meter has easily connected solid ground, a fast-response tube.

**Meaker Co, Nutley, N. J.** **(8)**

## Wet Vacuum . . .

**. . . has 31-in. squeegee** for fast, wide-track water pickup on large floor areas. Walk-Along Squeegee vacuum cleaner is reportedly easily maneuvered because its four-caster assembly allows movement in any direction. The squeegee, mounted on the rear of the caster assembly, can be retracted for fast movement from

*(Continued on page 64)*




# ALL-ALUMINUM WEDGE CLAMPS

**SERIES AA**

*eliminate bi-metal contact and galvanic corrosion*
*for stronger, longer lasting service dead-ends*

Blackburn Series AA Wedge Clamps are designed and engineered for use with aluminum neutral messengers at service dead-ends.

Construction is heavy-gauge, high strength aluminum alloy. This aluminum-to-aluminum contact eliminates galvanic corrosion between dissimilar metals.

No need to thread the cable through the clamp. Because slider is removable, the clamp can be easily installed anywhere on a continuous run of conductor. Wedging action, as strain is applied to the neutral, grips tightly along the entire length of contact. Re-establishing proper sag is quick and easy.

Two types of bails available for easy installation: flexible strand with nylon jacket or rigid stainless steel, locked to wedge so it won't pop loose.

You can reduce inventory with this versatile series of clamps. Only four sizes will dead-end a range of cables from #6 solid through #4/0 ACSR.

Blackburn Wedge Clamps are also obtainable in chromated aluminum for highly corrosive atmospheres and in stainless steel for copper neutral messengers.

The entire line of Blackburn Wedge Clamps is available from your electrical distributor.

**Jasper**
**BLACKBURN**
**Corporation**

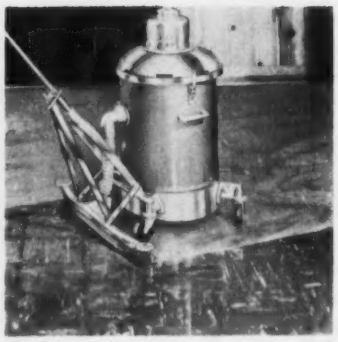
**1525 Woodson Road • Saint Louis 14, Missouri**

CIRCLE 63 ON READER SERVICE CARD

You're looking inside the adjustable headband of a GenTex Safety Hat. This hat resists dielectric shock up to 25,000 volts. Resists impact, too—better than 40 foot-pounds. The 6 point suspension system headband (same principle in Jet Pilot helmets) snaps in, has fingertip control and is fully washable. Brim and peaked cap models. Do more than just look at a GenTex . . . put one on and wear it 8 hours a day, 5 days a week. It's that comfortable! For complete information, write the GenTex Corp., 450 7th Avenue, New York 1, New York.

GENTEX® SAFETY HATS
another quality product
by the GenTex Corporation

61-9



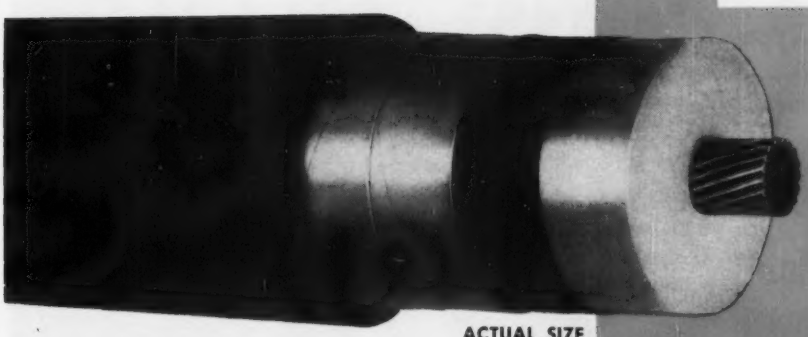
one area to another; handle of the vacuum cleaner is adjustable for use or can be positioned vertically for storage. The squeegee assembly can be used with most 15-gal tank vacuum cleaner models. The cleaner can also be used for regular dry vacuum cleaning by attaching a full-size hose.

**Hild Floor Machine Co, Inc, Chicago 7, Ill. (9)**

## Glove Inflator . . .

**. . . for field use,** enables linemen to visually inspect high-voltage rubber gloves quickly and easily. Especially compounded Neoprene O-ring holds glove securely in groove at top of device; elastic bellows, an integral part of the inflator, is pumped against any hard, smooth surface—then air is forced through one-way valve to inflate glove. The inflator allows inspection of 4 to 6 in. of cuff, plus whole glove. Unit is recommended to supplement periodic lab tests.

**Continental Safety Equipment, Inc, St. Paul 4, Minn. (10)**



ACTUAL SIZE

# 46 KV

# POLYETHYLENE
## INSULATED POWER CABLES

**Now SIMPLEX technology brings polyethylene's outstanding characteristics to higher voltage applications.**

- Proved in Performance
- Economical
- Low Weight
- At least seven-fold improvement in voltage life of polyethylene
- Specific Inductive Capacity Less than 2.5
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- For Wet, Dry, Overhead and Underground Installations

***Send for complete details***

**POLYETHYLENE CABLES BY Simplex WIRE & CABLE CO.**

EXECUTIVE OFFICES: Cambridge, Massachusetts • PLANTS at Cambridge, Massachusetts and Portsmouth, New Hampshire

**B** rush control

**A** rbor specialists

**R** ight-of-way clearance

**T** ree surveys

**L** ine clearance

**E** xperimental research

**T** ree trimming

**T** echnical consultation

More than 13 years ago Bartlett successfully pioneered the use of the helicopter for shade tree spraying—an operation that was to lead the way, a few years later, to a new efficient method of control of woody plants along utility rights-of-way.

At first, difficult terrains presented unusual problems but gradually through research and experience, new equipment was developed and new herbicides and techniques perfected to overcome them. Today, Bartlett research in this important field is carried on continuously through college fellowships and at the Bartlett Research Laboratories.

If your right-of-way clearance, line trimming, brush control or tree survey requirements present a problem, we invite you to share our years of experience. This service is now available from Maine to Florida, and west to Illinois and Alabama.

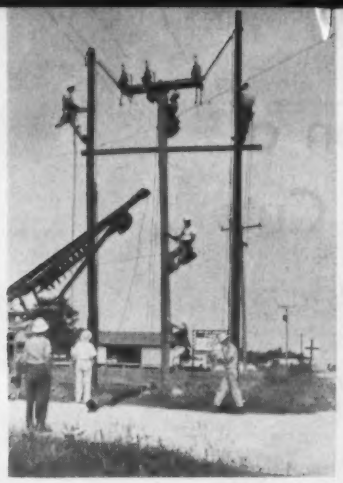
# BARTLETT TREE EXPERTS

**Home Office, 2770 Summer Street, Stamford, Conn.**
Research Laboratories and Experimental Grounds, Stamford, Conn.

ELECTRIC UTILITY METHODS

**E u m**

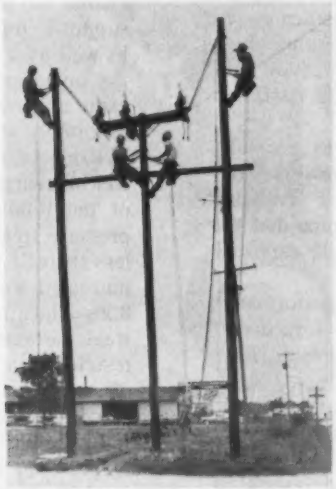
**FEATURE SECTION**



**H-FRAME** is installed adjacent to the pole; switch is locked 'closed'

**SWITCH** is raised to safe working position 2 ft above top of old pole

**OLD POLE,** after cutting, has butt removed from ground with winch



**NEW POLE** is set in original hole; switch handle is then reinstalled

**JOB COMPLETED** in 2½ hr, half the time if switch was disassembled

# Suspend Live Gang Switch to Replace Pole

Service interruption time and the time for doing the job were reduced when Carolina Power & Light Co foreman Joe F. Gainey replaced a 35-ft pole supporting a 12-kv energized gang-operated, air-break switch.

The pole-changeout required: supporting the crossarm which carried the conductors and switch; removing the defective pole; setting the new pole in its place; and, reinstalling the crossarm and switch.

Adjacent to the old pole, an H-frame was built, comprised of a 40-ft pole set four ft from the old pole on one side and a second 45-ft pole on the other side, where a ditch required greater length. An 18-ft by 4x4-in. timber was installed as a crossarm on these two poles, four ft below the switch arm.

With the H-frame set, rubber blankets and hoses were installed on the middle phase, on the switch handle side. A one-ft piece of crossarm was bolted to the switch arm under the metal switch bar to keep the switch locked in the "closed" position.

With the switch locked closed, two sets of blocks were installed, one from each side of the H-frame. The blocks were hooked into saddle swings on each end of the switch arm. The switch handle was then removed from the old pole. The through bolt was drifted out and the switch arm raised with the blocks to a safe working position approximately two ft above the old pole. The old pole was then free.

With the line truck grounded, the wench cable was rigged to support the old pole. Then the old pole was cut off about two ft above the ground, whereupon the top section was lowered to the ground. The pole butt was next removed with the wench and the new pole was set in the original hole.

With the new pole set, the switch arm was lowered into proper position and the through-bolt and switch handle were reinstalled. Finally, the blocks, H-frame, rubber blankets and hoses were removed. The job was completed in 2½ hours.

# Pressure-Injection of Toxic Chemicals Cuts Tower Wood Decay

**DAN L. DAVIES**, Manager, Technical Department, Wood Preserving Division, Koppers Co, Inc, Port Arthur, Tex.

Test experience of the Wood Preserving Division of Koppers Co, Inc, Port Arthur, Tex., has shown that pressure-injecting toxic chemicals into seasoned cooling tower wood eliminates decay to achieve marked savings in tower repair and wood replacement costs. Furthermore, these tests indicate that the existing standard specifications for treating tower redwood is inadequate in that the specification fails to place any restriction on the moisture condition of the wood prior to treatment.

Fifteen years ago, heart redwood was normally specified for the construction of cooling towers. Redwood was used in preference to other available species because its inherent durability provided the necessary protection required in the severe exposure of natural draft installations.

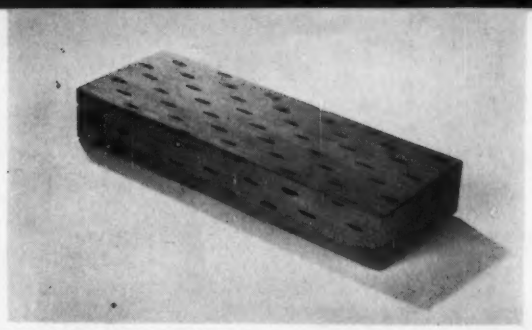
Because of redwood's satisfactory performance in these structures, its continued use in forced and induced draft towers was not even questioned. However, lumber in these more efficient towers began to show signs of deterioration in as little as five years.

Investigations conducted by the Institute of Paper Chemistry and by the Cooling Tower Institute indicate that the primary cause of wood failure in cooling towers is decay.

Once this was accepted, the Forest Product's Laboratory, a division of the US Department of Agriculture, developed a diffusion process by which chemicals toxic to fungus organisms could be precipitated onto the wood of standing towers. While the method has been found to be difficult to control and awkward to apply, the precipitated chemicals are expected to extend the life of cooling tower structures. Only time will tell the degree of success possible by this process.

A second, reportedly more efficient method of providing decay protection is available for cooling tower wood. This method involves the injection of toxic chemicals into the wood, using a pressure process. In order to compare the merits of pressure treated vs. untreated cooling tower lumber, in 1953 the Wood Preserving Division of Koppers Co, Inc, instituted its own testing program on a two-cell cooling tower being erected at the Williams (Port Arthur, Tex.) plant of the company's Plastic Div.

On one of these two cells it was decided to use part of the lumber pressure impregnated with a preservative, and the remainder untreated. Only the structural framework (up to the fan deck floor joists), partition wall and fill were treated in one cell. Untreated redwood was used in the remaining



**REDWOOD STRUCTURE** shows an incising pattern that allows uniform treatment if moisture content is limited

portions in that cell, as well as *all* the wood in the second cell.

In less than three years' time, Koppers found that all of the untreated wood above the water distribution system, and below the fan deck was seriously decayed and would have to be replaced. This included all of the mist eliminators, mist eliminator supports, tops of the structural frames and braces, as well as a portion of the fan deck floor joists and the untreated fill. All of the treated wood in these same areas was found to be completely sound. It is reportedly still in excellent condition today.

Koppers engineers estimated that 28,000 board feet of treated lumber was used, approximately 25% of the total wood in the cooling tower. Cost of pressure treating the lumber used was estimated at less than $1,400. Cost of repairs to that portion of untreated wood that had decayed was about $10,000. Thus, a total investment of $5,600 to pressure treat the entire cooling tower structure would have resulted in a $4,400 savings in less than three years of service, in addition to funds required later to replace the remainder of the untreated wood.

In the past few years, many millions of board feet of redwood for cooling towers have been pressure treated. Initially, standards or specifications for treatment were those that were based on the standard of the industry for other species. These specifications, however, failed to place any restrictions on the moisture condition of the wood prior to treatment, and it was found to be impossible to obtain suitable penetration in much of the material received by the plants.

During these years Koppers has gained much knowledge as to what is required to obtain the necessary penetration and retention in redwood.

It is the firm belief of the Koppers Wood Preserving Division that seasoned redwood lumber properly impregnated with an adequate quantity of preservative—distributed in the outer ¼ to ½ in. of wood—should provide decay-free service life for a minimum of 30 years. Experience has shown that it is necessary to maintain a rigid moisture content limitation prior to treatment, and to incise all redwood over 1-in. thick to a minimum depth of ⅜ in. before treatment.

The established adequacy of this treatment is based not only on penetration determined from borings taken from the treated wood but also on as assay of borings to determine preservative retention in the outer shell.

CIRCLE 27 ON READER SERVICE CARD

# LOOK... A NEW FARGO hot line CONNECTOR

*Ask your Line Material Field Engineer to give you complete details.*

Fargo's "HN Series" is designed to meet the demand for a hot line connector with current carrying capacity for main line connections and the fault currents associated with these applications.

Extra long contact areas, better conductor encirclement, greater mass, and an aluminum body minimize conductor cold flow and help overcome the effect of the inherent high contact resistance of aluminum conductors. Contact pressure is exerted on all strands assuring uniform distribution of current throughout the conductor eliminating local hot spots.

A soft, pure aluminum spacer tends to form around the strands sealing out corrosion and providing a permanent connection with a joint resistance less than an equal length of the conductor.

Completely enclosed greased threads are protected against weathering for easy removal even after long exposures.

All "HN Series" connectors may be quickly and easily installed by one lineman using standard tools.

Pat Pending

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
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Manufactured by
FARGO MFG. COMPANY, INC.
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FARGO

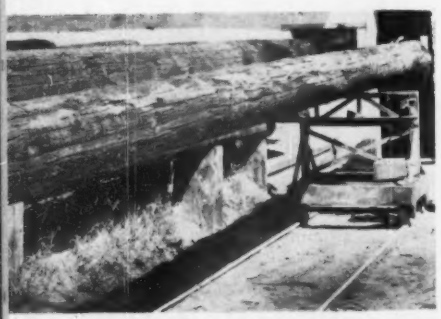
# Reclaimed 10,000 Wood Distribution Poles

**DONALD SEARLES**, Secretary and Sales Manager, Bell Lumber & Pole Co, Minneapolis, Minnesota

Over 10,000 obsolescent wood poles have been reclaimed by Northern States Power Co during the past eight years at about 40% of new pole costs.

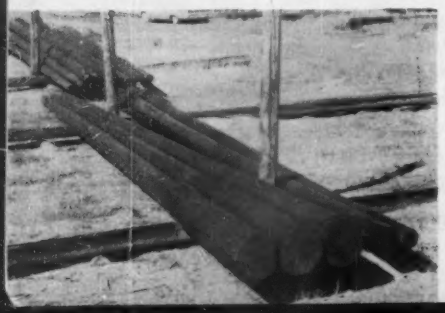
In Minneapolis, Minnesota, heart of the western red cedar pole treating industry, old poles of Northern States Power Co are brought into Bell Lumber & Pole Co's treating plant for reclamation and re-use.

These poles had already served their original purpose, exceeding a 27-year obsolescent factor. Obsolescence as referred to transmission or distribution poles includes poles removed or replaced due to road widening or diverting, increased voltages, new construction projects.



**POLES** readied for shaving, have exceeded a 27-year obsolescent factor

**SHAVING MACHINES** depth is set to sapwood thickness to gain poles below



Prior to the period 1941 to 1950, all western red cedar poles were butt-treated only, and no preservative protection was given to that area extending one ft above setting depth to extreme top of pole. The original incised ground line treatment method has proven very adequate by careful laboratory evaluation (Amer. Wood Preservers' Assn paper "Utility Pole Controls" by Tierney and Lund) but age took its toll on the unprotected aboveground line portion. However, extensive examination found that the deteriorated area existed only to the extent of sapwood thickness (about ½ to ¾ in.) and from that finding reclamation of western red cedar poles was deemed worthwhile.

It should be emphasized that research on this subject was either progressing or already in operation by at least two other electric utilities in the United States working entirely independently of the Northern States Power Co. These two utilities (Commonwealth Edison Co of Chicago and Detroit Edison Co of Detroit, Mich.) have their own cedar reclamation projects in progress.

In the reclamation process, the problem involved principally the removal of the deteriorated and fungas-infected wood above the butt-treated area. Shaving machines, such as pictured, can be adjusted for cutting depth to remove whatever wood is desired. In pole reclamation, depth of cut is usually set to sapwood thickness (½ to ¾ in.) and removal of all vulnerable sapwood is effected. As the heartwood of the cedar pole is exposed by the machine, sound, durable wood is found (highly toxic resins exist in western red cedar heartwood prohibiting the growth of wood-destroying fungi).

After removal of deteriorated sapwood above the ground line, the pole is then subjected to the close scrutiny of a Northern States inspector who, at that point, determines whether the old pole is worth reclaiming or not. Increment borings (into the pith center of the pole at the originally treated ground line area) are made plus visual examination of the entire pole. If no evidence of fungus attack in the interior heartwood is found at this inspection, the pole is deemed reclaimable.

Extreme pole-top deterioration is usually found on these 27-year-old poles and a minimum of 12 to 18 in. of wood removal is necessary. Because electric utilities invariably use poles in increments of 5 ft, the resulting cutback from top deterioration is 5 ft instead of 18 in. This means that reclaimed poles are always 5 ft shorter than the original.

The reduction in pole strength, due to the removal of all sapwood above ground line in the reclamation process, (original sapwood has about the same strength characteristic as heartwood), must be compensated. Northern States' formula for evaluation of modulus of rupture of the reclaimed pole results in a "one size" declassification in rating. For example, a Class 3-45-ft pole brought in for reclamation will usually reclaim to a Class 4-40.

After the old pole has been full length shaved, inspected, cut back, and reclassified, it proceeds on as a routine pole for standard framing, ground-line incising for new setting depth, branding, and full length treatment in 5% Pentachlorophenol-petroleum solution (AWPA specification C8-58 or EEI spec TD-100).

Results of treatment are inspected by the same Northern States inspectors who check the wood pole prior to processing. When accepted poles are stockpiled, they become available for re-use for a "second journey" with the full confidence of Northern States personnel that they will serve another 27 years of satisfactory service, or more if obsolescent factors permit.

CIRCLE 26 ON READER SERVICE CARD

# HOLD IT!

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## GUY STRAIN INSULATORS

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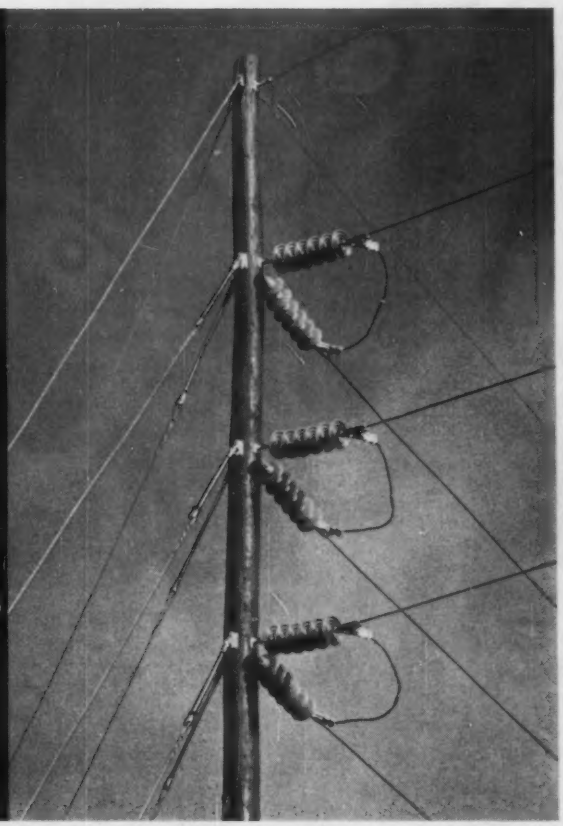

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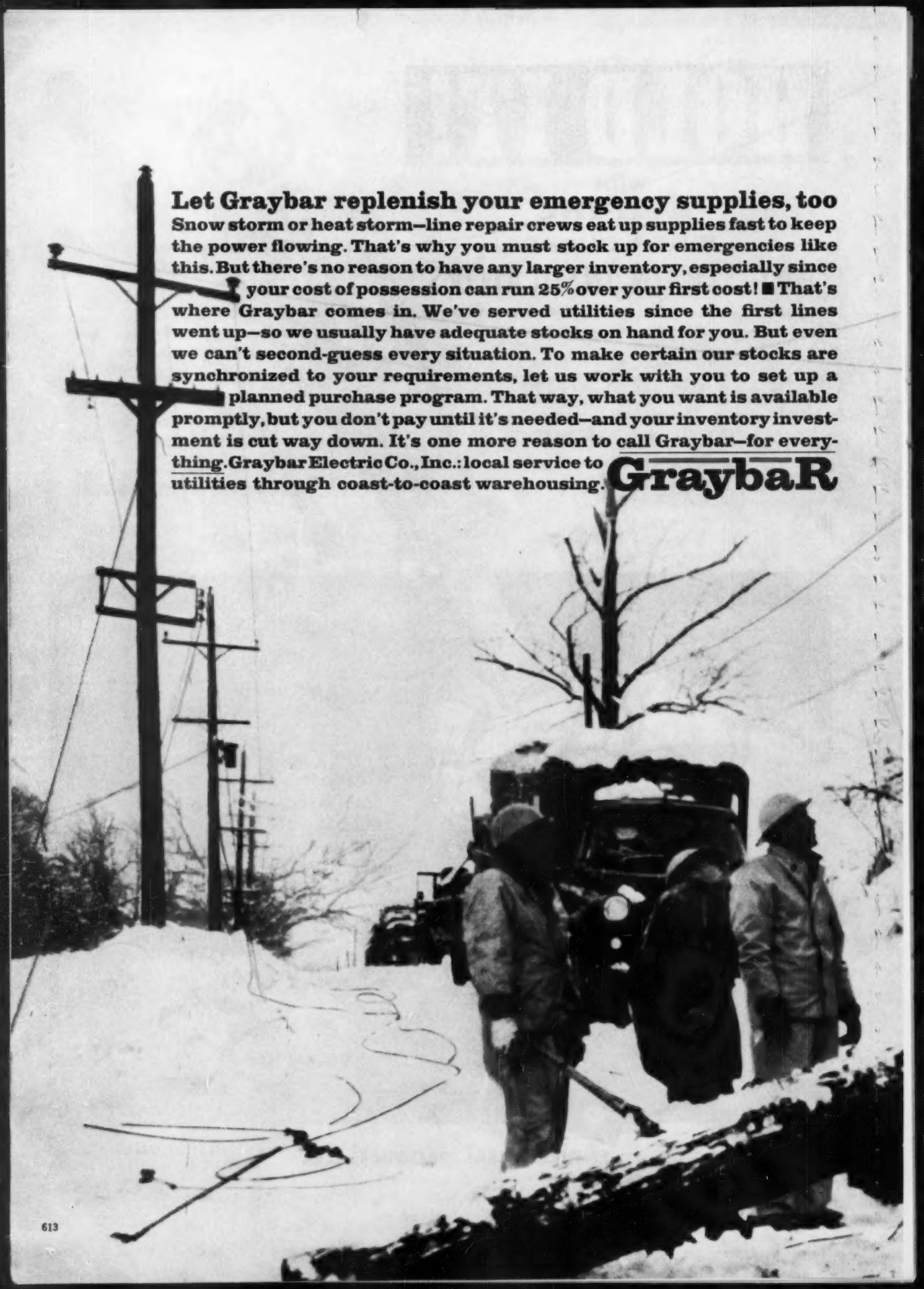
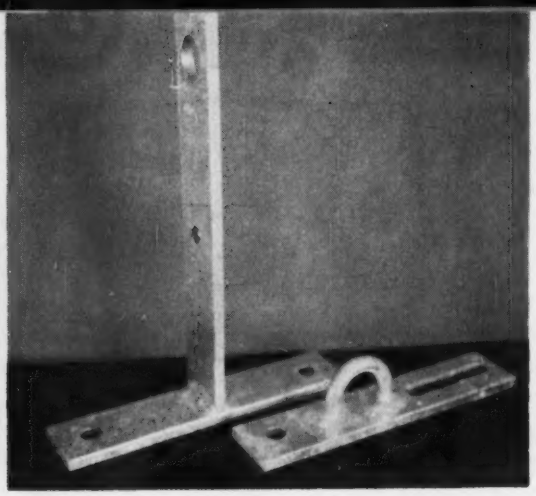
CIRCLE 71 ON READER SERVICE CARD 71



## Let Graybar replenish your emergency supplies, too

Snow storm or heat storm—line repair crews eat up supplies fast to keep the power flowing. That's why you must stock up for emergencies like this. But there's no reason to have any larger inventory, especially since your cost of possession can run 25% over your first cost! ■ That's where Graybar comes in. We've served utilities since the first lines went up—so we usually have adequate stocks on hand for you. But even we can't second-guess every situation. To make certain our stocks are synchronized to your requirements, let us work with you to set up a planned purchase program. That way, what you want is available promptly, but you don't pay until it's needed—and your inventory investment is cut way down. It's one more reason to call Graybar—for everything. Graybar Electric Co., Inc.: local service to utilities through coast-to-coast warehousing.

**GraybaR**



# Dead-end Triplex Cables on Stone or Brick

**ERVIN R. EHMKE**, General Foreman, Hales Corners Overhead, Electric Dist Dept, Wisconsin Electric Power Co, Milwaukee, Wis.

Overhead divisions of Wisconsin Electric Power Co are using "ring" and T-type brackets for economical dead-ending of triplex cables on buildings faced with brick or stone. The brackets, used effectively since early 1960, have helped save 585 man-hr and $4,250 per year. They provide a method of attachment which is not only easier and safer to make but also is strong enough to hold the service cable whether it is installed before or after the brick or stone veneer is placed on the building.

Prior to the development of these two brackets, compact No. 4 or 1/0 aluminum triplex service cables were attached in one of two ways. If the building sheathing was exposed and the cable pulled directly away from the building, an insulated holder with a 3-in. screw shank was installed flush with the sheathing, fastening directly to the studding. However, a service crew had to return to the job and remove the flush-type holder to allow for the masonry installation. The cable was then re-installed, or a holder was used and cemented into the masonry.

If the service cable pulled away from the building at an angle, a 7-in. wire holder was installed with about 2½-in. of the screw shank penetrating the studding. The exposed shank section of the holder was blocked out with wood to allow the shank to be bricked in. However, unless the holder was bricked-in soon after installation, the strain of the service cable would cause the holder to pull out.

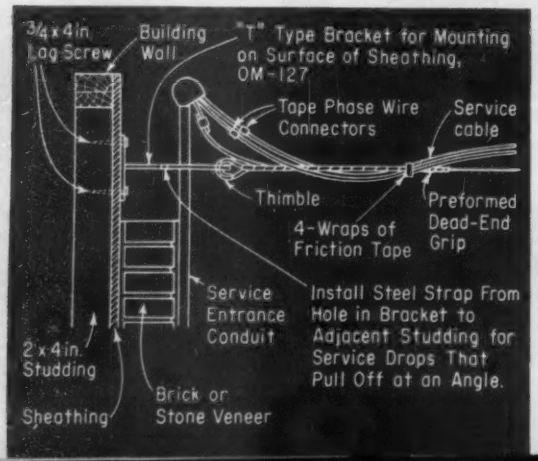
To eliminate the added cost and hazard of these former methods, the ring and T-type brackets were developed. The ring bracket is designed for mounting on the surface of brick or stone veneer, with 4-in. lag or toggle bolts fastening it into the masonry. The T-type bracket is used for mounting on the exposed sheathing. It has 4-in. lag screws which fasten to the studding. The leg of the T protrudes horizontally from the building, and thus can be bricked around.

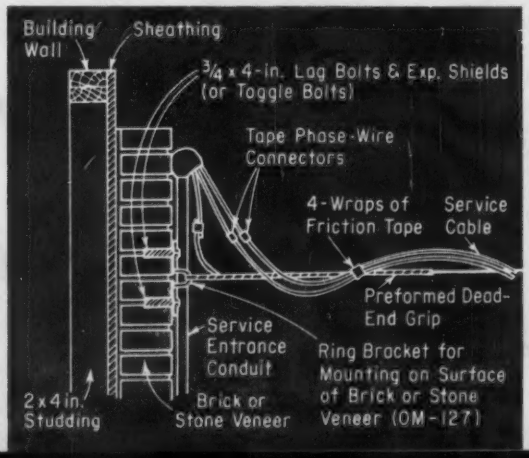
Each overhead line truck on the WEPCo system is "standard loaded" with one ring bracket and one T bracket; service crews are supplied with three of each. It is estimated from records that 110 ring brackets and 85 T brackets are installed per year.

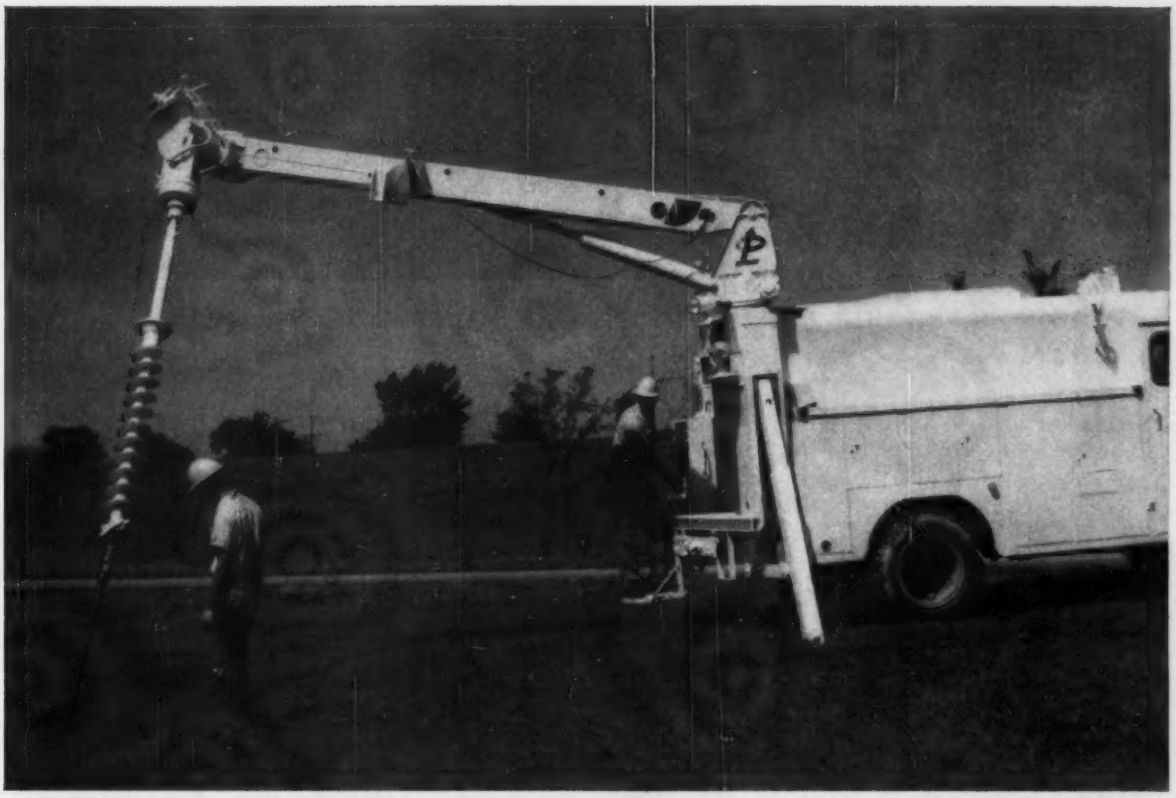
Unit costs are $0.947 for the ring bracket and $1.15 for the T bracket, as compared to $0.465 for the old-style 3-in. wire holder and $0.405 for the 7-in. holder. However, the average saving per job is $17.50, based on the saving of one hour per job for a three-man crew.

*(More Construction on page 76)*

**TWO NEW BRACKETS DEAD-END** triplex cables economically on buildings faced with brick or stone veneer. T-type brackets (left) are mounted on exposed sheathing; ring brackets (right) support cables on surface of brick


3/4 x 4 in. Lag Screw
Building Wall
"T" Type Bracket for Mounting on Surface of Sheathing, OM-127
Tape Phase Wire Connectors
Service cable
Thimble
Preformed Dead-End Grip
4-Wraps of Friction Tape
Service Entrance Conduit
Install Steel Strap From Hole in Bracket to Adjacent Studding for Service Drops That Pull Off at an Angle.
2 x 4 in. Studding
Sheathing
Brick or Stone Veneer


Building Wall
Sheathing
3/4 x 4-in. Lag Bolts & Exp. Shields (or Toggle Bolts)
Tape Phase-Wire Connectors
4-Wraps of Friction Tape
Service Cable
Preformed Dead-End Grip
Service Entrance Conduit
Ring Bracket for Mounting on Surface of Brick or Stone Veneer (OM-127)
2 x 4 in. Studding
Brick or Stone Veneer



Equipment with derrick-type booms, like the Pitman "Pole Cat," permit installation at any angle, and without removing the auger.

# Mechanized Anchoring Cuts Costs

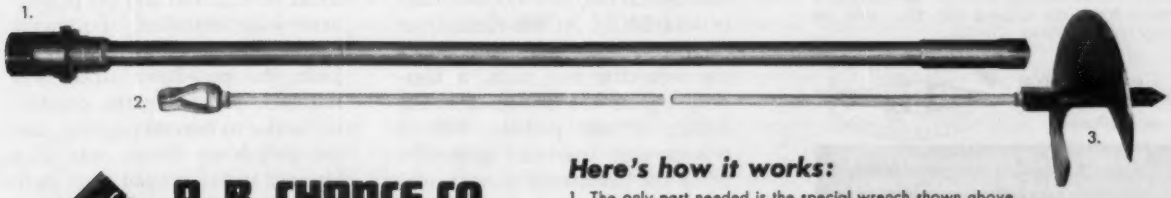
## Your hole boring equipment will speedily install Chance Screw Anchors anywhere that you can bore a hole

5 to 8 man-minutes! That's all the time it takes to install Chance Power Installed Screw Anchors with your power hole-digging equipment. You speed installation, cut costs, and realize a greater return on your investment in power equipment.

These Chance Anchors eliminate slow, tedious labor. Line construction is faster. Your power boring equipment, regardless of type can be easily adapted to power anchor installation.

Chance Screw Anchors range in size from 78 to 176 square inches in area. Hundreds of installation and pull tests prove that Chance Power Installed Anchors hold more load with less creep than any other anchors of comparable size.

Mechanize with Chance and get lower installation costs and better utilization of expensive equipment. Contact your Chance Representative. He'll show you how to improve your anchoring through mechanization.




**A. B. CHANCE CO.**
CENTRALIA, MISSOURI
A. B. Chance Co. of Canada, Ltd., Toronto

CA61-33

### *Here's how it works:*

1. The only part needed is the special wrench shown above. Wrenches are made to fit all popular makes of power borers.
2. Thimbleye, Twineye and Tripleye guy wire nuts are available. They distribute pulling stresses uniformly . . . keep guy from kinking or bending.
3. Sharp cutting helix of structural steel minimizes earth disturbance. Special hub fits lower part of wrench.

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EXTRA-REACH TELESCOPIC

**HOT STICK**

**TESTED BY TIME — PROVED IN USE . . . by some of the LARGEST UTILITY COMPANIES in the country!**

TEL-O-POLE, the original Hot Stick with the POSITIVE LOCKING JOINTS has experienced thousands of hours of rugged service, and has been tested under the most adverse conditions.

- ★ Pin location automatically aligned when sections are in extended position.
- ★ Standardized parts eliminate costly delays when in need of replacement parts.

FOR YOUR PROTECTION — FOR ADDED SAFETY AND DEPENDABILITY — always specify TEL-O-POLE, the original Hot Stick with the POSITIVE LOCKING JOINTS.

*Guaranteed Not To Slip, Twist or Collapse*

TELESCOPIC TEL-O-POLE SURE-LOCK JOINTS

*Write for full information, specifications, and price data . . . today.*

HASTINGS

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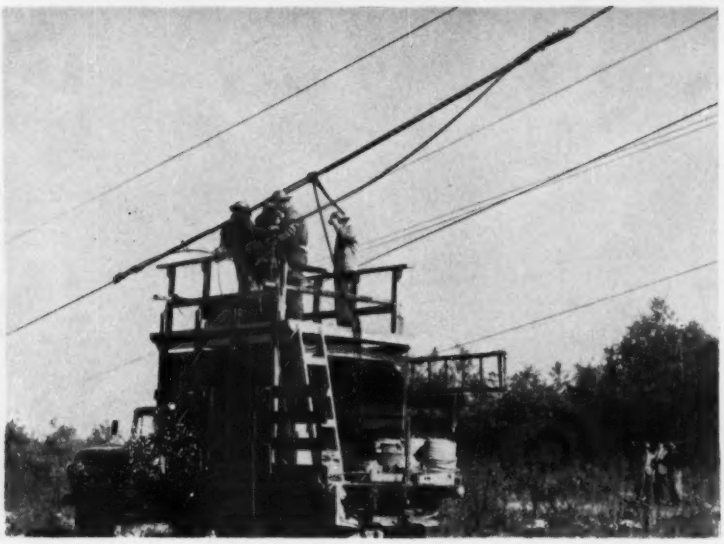


**PULL-DOWN BLOCK DEVICE** (top), drop-lined to truck winch, lowers conductor to working platform. Conductor tension is taken up by ratchet hoists

# Make 500-Kv Splice From Truck


**W. R. CLANTON,** Construction Engineer, Tennessee Valley Authority, Chattanooga, Tenn.


In stringing a bundled, 3-conductor, 500-kv transmission line in middle Tennessee recently, Tennessee Valley Authority used a truck-mounted working platform and a pull-down device to eliminate otherwise cumbersome and greater time-consuming methods—thus greatly facilitating the joint-making.

The TVA construction crew first pulled out two 4,000-ft reels of 954 MCM ACSR cable from each set-up. To join the conductor from the two reels, a temporary joint was first made at the middle of the pull-out with a woven wire open-end grip. To make the permanent joint, a special job-made pull-down block device (top) with a drop line attached was used to lower the conductor so that it could be reached from a working platform constructed on top of a crew truck (bottom) where the joint could be readily made with the conductors already strung.

From the platform, the workmen attached a come-along on either side of the temporary joint and connected them with two cable slings and a ratchet hoist. Tension of the conductor was taken up by the ratchet hoist, thus freeing the temporary joint section so the woven wire grip could be removed and the permanent joint installed. Following completion of the permanent joint, the pull-down strain was released, permitting the conductor to rise to normal position, and the pull-down device was then lowered to the ground after pulling a trip which caused the block to tilt over and fall away from the conductor.


*(More Construction on page 78)*

# NOW... brush killed while nature sleeps

**NEW: Dormant Cane Broadcast with Diamond Line Rider formulations**
**RESULT: Lower costs, extended application season, less risk of crop damage**

**Three years** of commercial and semi-commercial testing are over. The answer is, "Yes." The Diamond Dormant Cane Broadcast method of applying 2, 4-D and 2, 4, 5-T has been proven. The advantages can be put into effect.

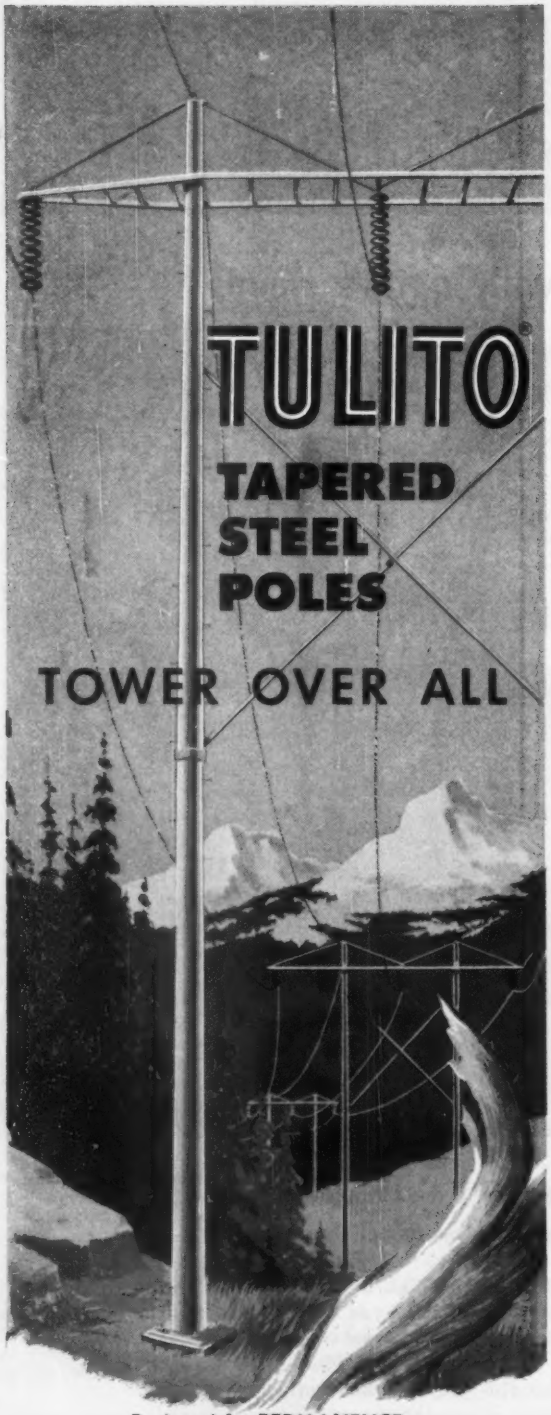
This new method can now supersede stem-foliage and basal treatment. Dormant Cane Broadcast treatment can be applied over the entire woody plant from October to February. You use low-pressure sprays—you need only half the time required in basal treatment.

Diamond Line Rider formulations are the proven chemicals from three years of experience—as the best material, they do the best job. Send for technical bulletin on "Dormant Cane Broadcast." Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals



CIRCLE 77 ON READER SERVICE CARD




Designed for **PERMANENCE**
Engineered for **DEPENDABILITY**
Equipped with Tulito Safety Clamps to
insure workman **SAFETY** ascending—descending

*Available with either steel or wood cross arms. For complete information write:*

**MEYER MACHINE, INC.**
RED WING, MINNESOTA

# Helicopter Hauls 200 Poles Per Day With Cluster Sling

**JOSEPH R. RAUB,** Civil Engineer, Helicopter Section, Puerto Rico Water Resources Authority

The Helicopter Section of the Puerto Rico Water Resources Authority has recently placed in operation a new cluster sling that allows the hauling of over 200 poles per day in mountainous terrain. This new procedure now allows the Authority to place a fully dressed secondary or primary pole at a cost of less than $7.50.

The cluster sling allows the simultaneous hauling of either five secondary poles, or three primary poles, or combinations thereof.

The cluster sling consists of a standard steel channel upon which three to five electrically operated helicopter cargo hooks are mounted. The steel channel is slung beneath the helicopter on cable rigging to which is taped the hook-release control circuit wiring. The hook release system is operated from the helicopter's 24-v electrical system.

In order to haul a group of poles to a field site and set each pole in sequence directly into previously dug pole holes, it is necessary that the poles hang from the helicopter at varying heights. Accordingly, when initially picking up the poles, the first pole to be set at the field site is rigged with the longest cable; the second pole to be set is rigged with a cable shorter by an amount at least in excess of the depth of the first pole hole, the third is cable-rigged again that much shorter, etc.

The actual task of setting each pole in its respective pole hole is a routine matter with the helicopter —the helicopter pilot positions the pole into the hole and the helicopter observer releases the pertinent cargo hook by pressing a "release" button.

*(More Construction on page 80)*

CIRCLE 28 ON READER SERVICE CARD

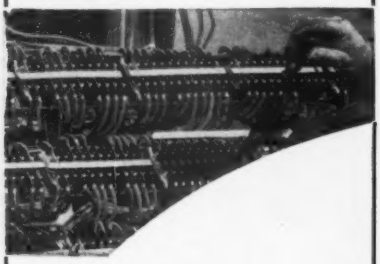
# This marker frees one man from tracing cables

The Amprobe Cable Tracer* enables you—by yourself—to trace ten uncoded circuits simultaneously ten times faster than any other method. Simply plug one end of the conductors to be traced into the markers (there are ten of them), the other ends, in pairs, into the pocket-sized Cable Tracer, press the button, and a number lights up to provide unmistakable identification. See your distributor or write today for more details.

Here are some typical, broad category applications:
■ Trace commercial and residential meter circuits.
■ Identify control cable circuits at substations, plants.
■ Check power cables used in auxiliary equipment.
■ Trace switch panelboard circuitry. ■ Test for opens and shorts. *$39.50 (slightly higher outside U. S.).

AMPROBE INSTRUMENT CORP.
LYNBROOK, NEW YORK
CANADA: ATLAS RADIO CORP., 50 WINGOLD AVE., TORONTO

*This Picture Tells An Interesting Story—*



*Here's Why:*

The Relay Tester or Maintenance Man behind this hand can check relay circuits without touching any panel wiring. This is possible because STATES Type NT Sliding Link Terminal Blocks were used in these circuits. STATES Blocks can be furnished in any number of poles, front or back connected, with or without coding strip and with or without cover.

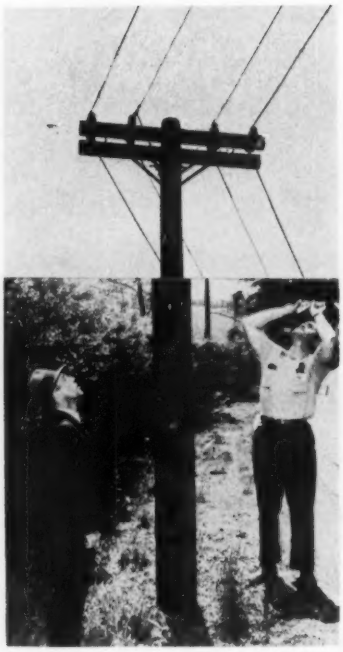
**STATES PRESENTS A Wide Range of RELAY TEST TABLES**

**FORM RFA**—Adjustable Current and Potential & Phase Displacement in either 5° steps or continuously.

THE STATES COMPANY

**THE STATES COMPANY**

*3 New Park Avenue • Hartford, Conn.*



## Adjustable Protractor

**EDWARD G. STEFFE,** Estimateman, Overhead Lines Layout Section, Electric Distribution Dept, Baltimore Gas & Electric Co, Baltimore, Md.

The electric distribution department of Baltimore Gas & Electric Co recently adopted an adjustable protractor to simplify measuring line-angles in pole lines. One man can now do the job normally requiring two, do it in less time and also eliminate the possibility of accidents where vehicular traffic is concerned.

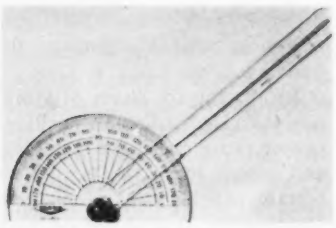
The new method requires a protractor with an indicating arm to measure angles. The protractor, with flat-plane parallel with the ground, is held upward

## Boom Reaches 140 Ft to Place Hillside Poles

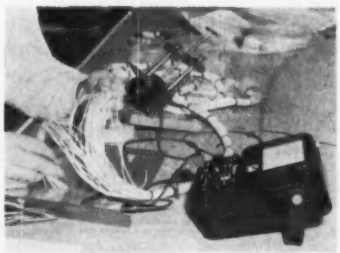
Faced with the task of placing poles in almost vertical hillsides, Washington Water Power Co crews rigged a 40-ft log jib to a 100-ft boom crane to solve a construction problem that not even a helicopter could handle.

WWP expects to complete the 20-kv line from Orangeville, Idaho, to Elk City, Idaho, in October. The 50-mile line will provide the first central electric service for Elk City. The line follows the south fork of the Clearwater River into a rugged area in north central Idaho.

## Gives Pole-Line Angles



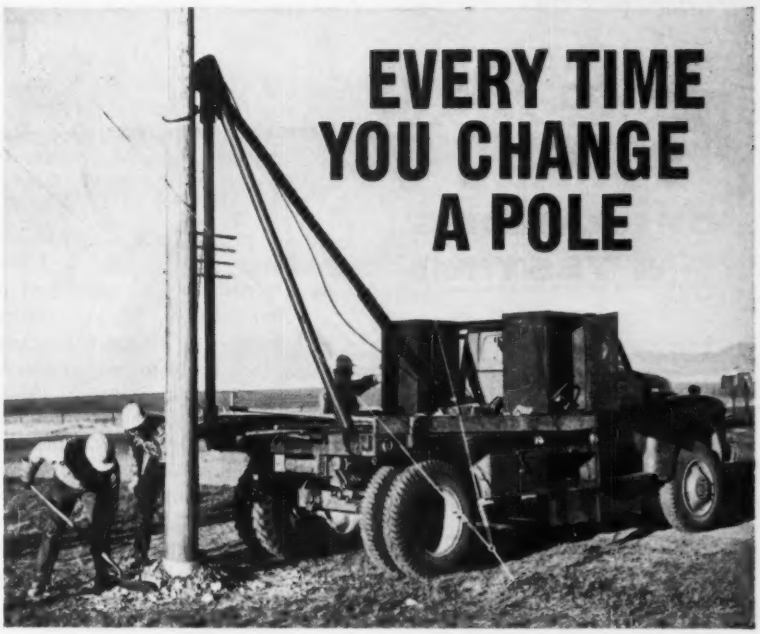
for sight-aligning with the pole-lines. First the line wire on one side of the pole is aligned with line "O" on protractor. Then the indicating arm is moved to align with the wire "going-away" on the other side of pole. The deflection angle of the pole-line can readily be read where the scribed line on the indicating arm crosses the protractor scale.



## 'Plate' Spots Wire

Checking continuity and identification of control wires in a bundle is simplified using the "common-plate" method.

With the new method the ohm meter lead, instead of being touched to each wire, one at a time, is hooked to an 0.040-in. scrap aluminum plate. The technician divides the bundle of wires approximately in half, and touches a half-bundle's end to the plate. If the ohm meter shows that this bundle has the desired wire, the other half-bundle is dropped, and the correct half-bundle is divided again, and the halves tested. In this manner the bundles are halved and halved again until the desired wire is located.

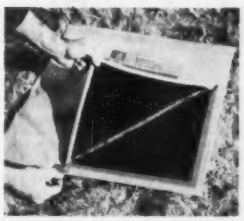




# Protect it with a POL-NU® PAK

When a pole is removed from one location and re-set in new earth it is subject to rapid decay and insect attack at the critical ground-line area. Renewal of preservative protection is vital to obtain longest possible service life.

The Chapman Pol-Nu Pak makes it easy for line crews to apply ground-line preservative to "road-moves" and poles being returned to service. It is an envelope-type bandage containing Chapman Pol-Nu, grease-type preservative which gives long-lasting protection.

Pol-Nu Paks are available in several sizes and, because of their convenience, are often preferred for down-the-line treatment of standing poles. Factory sealing of the Pak always insures the proper amount of preservative application for maximum protection without waste. The photos below show how easily it is applied. Mail coupon for data.



Slit Pol-Nu Pak on three sides to expose preservative.

Wrap bandage around pole at ground-line and staple.

Back-filling completes job, assuring longer pole life.

**CHAPMAN CHEMICAL COMPANY**
Leading manufacturer of wood preservatives • Memphis 1, Tenn.

CHAPMAN®
POL-NU
PAK

**MAIL COUPON FOR COMPLETE DATA**
Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.

Please send data on the Pol-Nu Pak to:

Name _____

Company _____

Address _____

ELECTRIC UTILITY METHODS

Eum

**OPERATIONS & TESTING**

# Float Coal Crusher

**FREDERICK BRADSTREET,** Applications Engineer, Isomode Division, MB Electronics, New Haven, Conn.

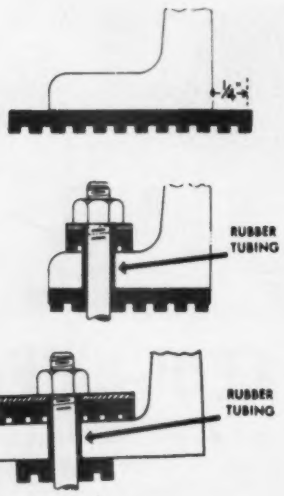
By placing layers of vibration isolating pad between a 17-ton coal crusher's bed plate and its anchor frame, Long Island Lighting Co eliminated severe vibration problems which threatened extensive damage to its Barrett Power Station building structures and to adjacent equipment. Elimination of the severe vibration normally associated with heavy coal crushers provided an environment more conducive to worker efficiency and good morale.

Vibration generated by the crusher is caused by the unit's 8,600-lb spider rotor and occurs at a harmonic of the drive shaft speed of 700 rps. With bolted construction, vibration would be transmitted through the bolts to the 5-in.-thick supporting pad and on to the frame of the crusher tower. The crusher sits 50 ft above ground level. Tests indicated the magnitude of the vibration would have been sufficient to seriously damage the building.

By placing six layers of vibration isolating pad at 14 positions between the crusher's bed plate and anchor frame, the severe vibration problem was eliminated. The crusher thus floats on pad, isolated from the tower. The support of the 13x8½-ft bed plate required three sizes of pad stacks—8x10 in., 6x8 in. and 2x8 in.—spotted strategically to provide uniform load distribution. Eight of the largest stacks were spotted along the sides of the crusher, while the six smaller stacks were placed under the light 250-hp crusher motor and coupling housing. All pads are loaded to 50 psi.

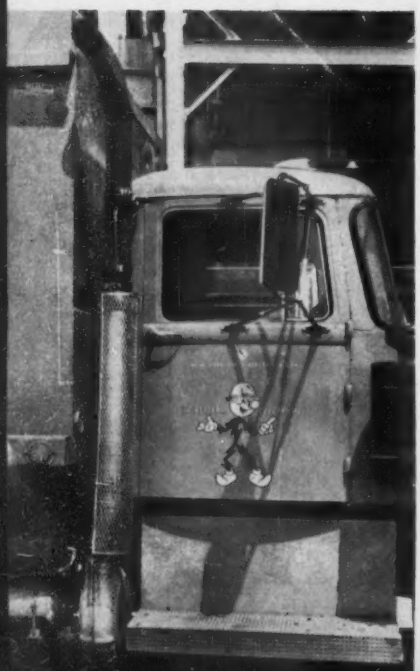
Horizontal movement of the crusher is particularly severe when tramp iron is encountered in the coal. This movement is isolated by placing three vertical layers of pad in four positions at the corners of the crusher between the pad plate and vertically welded steel plates on anchor frame.

When placing the vertical




**NORMAL ISOLATION** installation (top) requires no bolting; high horizontal vibratory forces require bolting (center); hangar type isolation is for lightweight machines (bottom)

# Double-Filtered Air Plus Vertical Exhaust



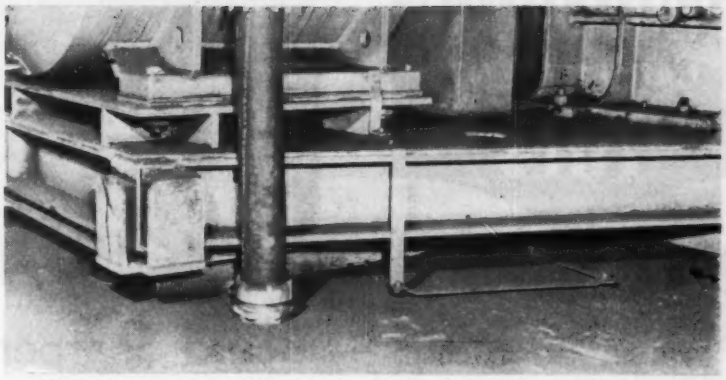
Modifications to a standard-type fly ash hauling truck have solved a critical engine damaging dust problem at New York State Electric & Gas Corp's Milliken steam generating station. Furthermore, the spotless appearance of Milliken station and all company vehicles is now not contaminated by the hitherto swirling clouds of fly ash.

Although meager in proportion to coal consumed, the actual tonnage of fly ash removed at Milliken station is high. The plant's boilers produce 180 tons of fly ash daily, all of which must be trucked away. It was this stage—loading chute to truck—that played havoc with truck engines. Although the loading chute is placed as close to the truck as possible, still the initial drop of fly ash creates a huge dark dust cloud which envelopes the vehicle. As the load piles toward the top, dust rises to eddy and swirl outside the truck, and underneath the chassis, whence it quickly finds its way to the engine area. No amount of loading care prevents this condition. Although water is mixed with the dust in a hopper, water sufficient to hold down the dust thickens the texture, making it impossible to dump.

As prohibitive engine replacement expenses grew, plant officials asked the various manufacturers of trucks operating at the station to devise additional

# on Isolating Pads

Isomode pads, glue was applied to hold them in position until a 10-lb horizontal load could be applied to position the pads and take up initial slack. The vertical plates which hold the pads in place were first bolted to maintain a 10-lb horizontal load until they could be tacked into place by arc-welding. The cross-ribbed isolating Isomode pad made of oil-resistant Neoprene, effectively isolated the coal crusher for a materials cost of about $40. By using these pads, made by the Isomode Division of MB Electronics, New Haven, bolting for the 17-ton unit was eliminated.



**VERTICAL SETS OF PADS** (on lower left) are glued in place between the crusher base and the steel plates welded to the rigid floor anchor-plate

Design features, such as the patented cross-ribbed pattern utilized in Isomode Pad, make pads particularly efficient energy absorbing devices. As a result, horizontal forces several times the weight of the mounted machine can be generated without slippage occurring. In addition, the material is also an effective sound suppressor, producing a marked reduction in annoying background noise. A typical pad has a thickness of $\frac{5}{16}$ in. If an application requires a greater thickness, multiple layers are used, as was the case at the Barrett Station. The disturbing frequency of the operating equipment dictates the number of pads required as explained later. Load alone dictates pad size.

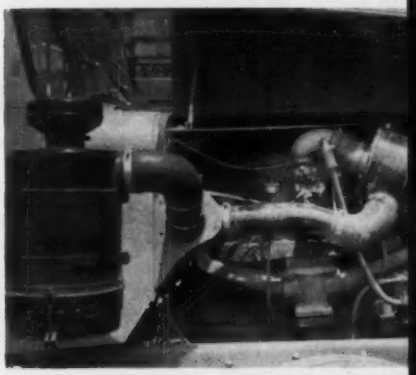
Low speed, heavy machinery running less than 1,300 to 1,500 rpm, such as Barrett's coal crusher, usually require more than one layer of pad to obtain effective vibration isolation. The number of layers of pad required for 65% isolation of the disturbing frequency can be determined from the charted data supplied by the manufacturer. If more than three layers are used, a thin steel plate is generally inserted between each layer.

CIRCLE 29 ON READER SERVICE CARD

# Cuts Engine Damage

engine protection. An effective solution, applicable to other jobs of a similar environment, was devised by Brockway Motors Truck, Cortland, N. Y.

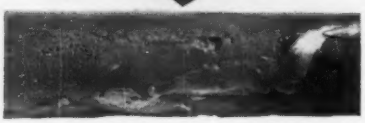
Brockway engineers installed an enlarged, heavy-duty, supplementary oil bath air filter. This unit was positioned outside the hood and was connected by a specially designed piping system to a dry air filter located under the hood, thereby insuring that all air leading to the brake and engine system would be double-filtered. Because double-filtering would reduce the normal air supply to the engine, it was necessary to increase the size of the oil bath filter—supplying enough air was every bit as vital as supplying dust-free air. Also, extra attention was given to all breather openings to insure an absolute seal—even the oil dip stick was fitted with an overlapping flange. Finally, while it is unusual to pipe exhaust upward on a gasoline-powered truck, it was mandatory in this case. An exhaust system was designed which, while conserving space, prevented exhaust pressure from "riling up" the fly ash. This was partly accomplished by merely turning the outlet away from the truck body instead of toward the rear. Then by running the exhaust pipe upward, diesel style, any fly ash on the ground remained undisturbed rather than being blown about.



**EXHAUST PIPE,** out the side and vertical (left page), plus heavy-duty supplementary oil-bath filter (above) prevents ash from entering engine

CIRCLE 30 ON READER SERVICE CARD

# CATHODIC PROTECTION CAN PREVENT THIS



## IN DUCTS and CABLES

Corrosion is the natural enemy of lead-sheathed cables installed in underground ducts. The application of impressed current cathodic protection by means of a distributed system in adjacent underground ducts is accepted as a positive means to avoid failures.

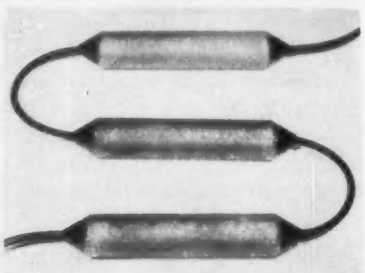
Durco impressed current anodes have proved far superior to all others. Avoid cable failures. Specify Durco Type G anode assemblies.

We'll be glad to send you more detailed information on Duct Applications. Ask for Bulletin DA/7.

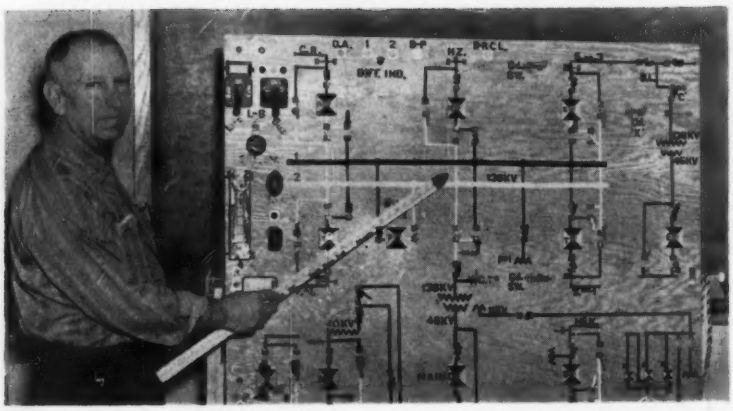
**THE DURIRON COMPANY, INC.**
**DAYTON, OHIO**

**DURCO**

*This is part of a DURCO Type G flexible anode assembly used in a distributed anode system as a means of accomplishing cathodic protection in congested areas.*



CIRCLE 84 ON READER SERVICE CARD

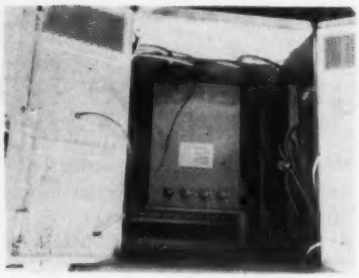



# 'Board' Sharpens Operators' Work

A model switchboard, made by operators at Kentucky Power Co's Beaver Creek substation, is being used to sharpen operators' performance. The board has a one-line diagram of the 138-kv station with switches, oil circuit breakers, regulators, synchronous condenser and main feeds in and out of the station. It uses lights, just as a main panel does, and small blade switches represent the air break and disconnect switches.

The operators use the board to set up problems and to solve them for best solutions. One of the builders of the board, says, "The board helps to prearrange and check work, train switchmen to perform duties more safely, efficiently, accurately and promptly. It makes work easier, not harder. It is a matter of work simplification."

The board, originated by C. J. Aders, C. Wallen, and B. Little, has also been used at safety meetings to show how it can improve operators' performance.



# Air-Cooled 'Mobile' Cuts Outages

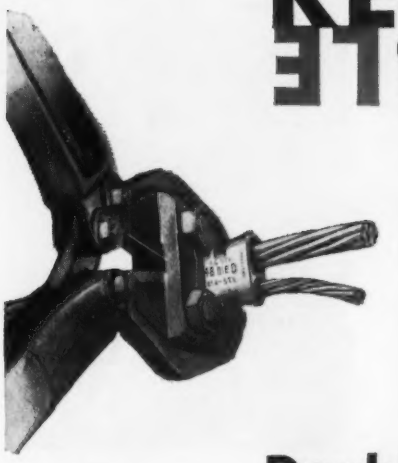
New Jersey Power & Light Co is solving distribution system outage problems with a special-type trailer-mounted tankless transformer. The units serve as an emergency supply in case of transformer failure, and as a supplemental transformer during line or transformer changes.

The transformer was developed and manufactured for NJP&L by Hindle Transformer Co, Flemington, N.J. Considerable care was taken to insure that the windings were isolated from all vibrations and shock.

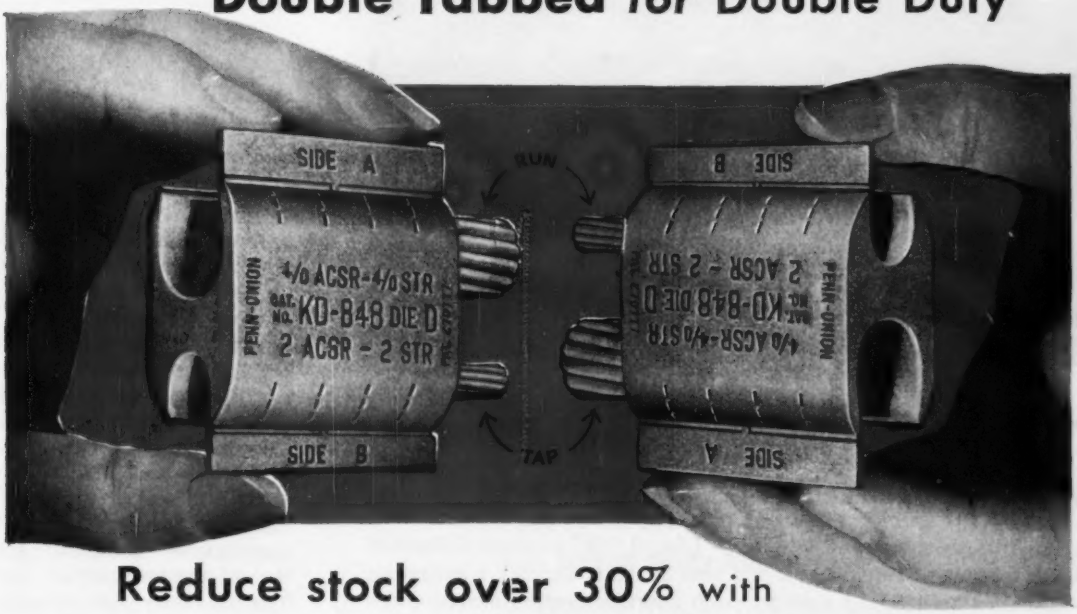
The transformer is rated at 50 kva, single phase, 60 cycles, and is air-cooled; the primary is designed for 4,800 v and the secondary for either 120 or 240 v. The unit is designed to withstand several service hours with an overload as high as 50%.

CIRCLE 31 ON READER SERVICE CARD

# REVERSIBLE



## Double Tabbed *for* Double Duty




## Reduce stock over 30% with

# Penn-Union ***Double-Tab*** "Press-On"

**Less Stock**— Reversible for dual application.

**High Conductivity**— E. C. Aluminum extrusions assure cool running high efficiency contacts.

**Easy Crimping**— Fully annealed for easy installation— deep indent crimp lines.

**Pre-Loaded Inhibitor**— Cleaned contact surfaces kept free of oxide re-formation by non-dripping Penn-Union "Cual-Aid." In colored polyethylene bag printed with complete information.

Crimp with tools you have

HAND or HYDRAULIC

using O and D dies

**Cu to Al**— Heavy spacer provides conductor separation and prevents strand cutting. Also minimizes galvanic corrosion.

**Weather-Protected**— Full-length tab provides complete enclosure for inhibitor.

**Cable Protection**— Heavy chamfering of cable openings protects main and run.

**The Complete Line**— Double Tab cable sizes #6 through 4/0. Single Tab cable sizes to 400 MCM.

**PENN-UNION ELECTRIC CORP., Erie, Pa.**

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PENN-UNION *a good connection*

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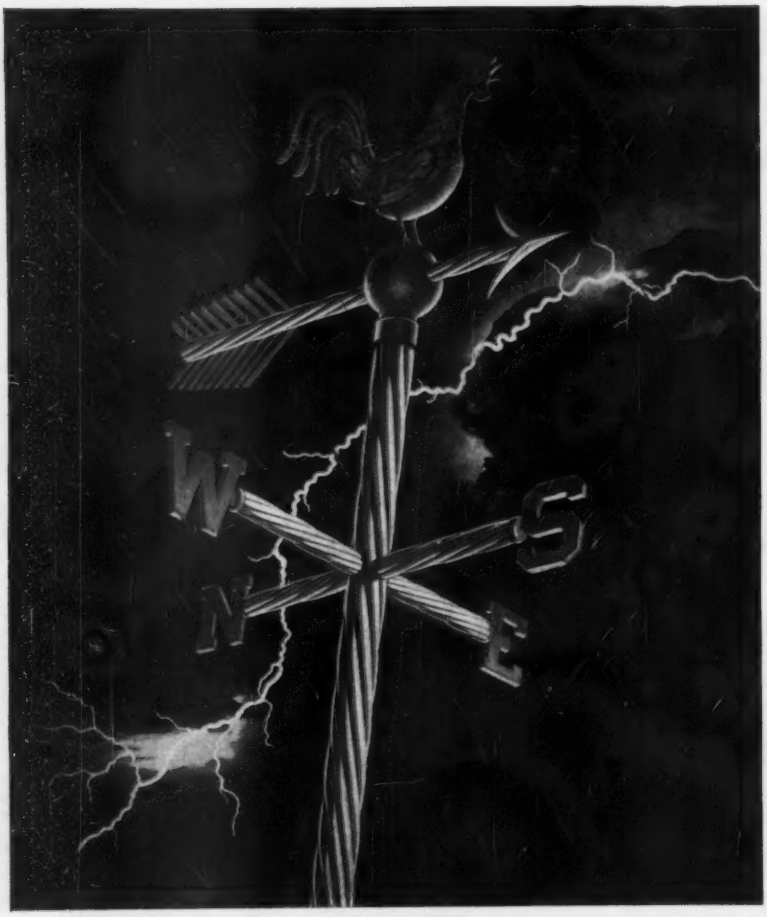



# The Galvanized Steel Strand with the built-in raincoat

Everybody talks about the weather . . . CF&I *does* something about it. To protect Galvanized Steel Strand against corrosion, CF&I builds in a zinc coating that shrugs off moisture. The result is a long-lasting, weather-resistant steel strand that is ideal for overhead ground wire and meets ASTM specification A-363.

Also highly suitable for guying assignments, CF&I Galvanized Steel Strand is made in seven- or three-wire constructions . . . in accordance with ASTM specification A-122. In addition, it can be tailor made to meet your particular specifications.

Like all CF&I products, Galvanized Steel Strand is made by a nationwide company to meet high American standards. For immediate delivery, contact your nearby CF&I warehouse or your local electrical distributor. 8139

THE COLORADO FUEL AND IRON CORPORATION
Denver • Oakland • New York
Sales offices in All Key Cities

LIGHTS on four corners of the roof turn on when unit is energized

## Compact Mobile Unit

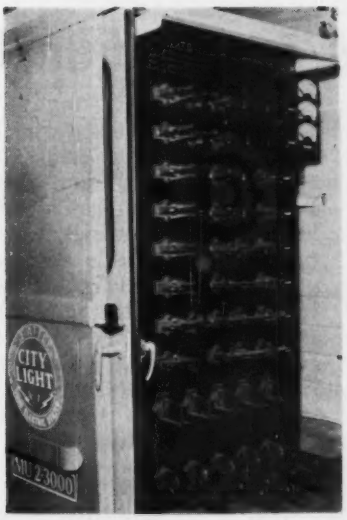
**WILLIAM H. ANDERSON,** Associate EE, Seattle Department of Lighting, Seattle, Wash.

An inexpensive mobile transformer unit has been assembled by Seattle City Light to meet emergencies on its 2,400-v distribution system. The new unit can be "cut-in" with speed and safety whenever distribution transformers must be replaced.

To achieve stated advantages, Seattle City converted a "metrowagon" into a mobile unit with two 100-kva (120/240/480-v) transformers mounted inside. One of the transformers has all four secondary coils brought out to eight bushings and the other unit has six bushings. All of these secondary bushings are wired to the rear of a switchboard made up of salvaged 15-kv, 600-amp disconnects. A lineman can operate these switches according to instructions to select any of these combinations:

- 120/240-v single-phase and 240-v 3-phase (3-wire or 4-wire)
- 120/208-v 3-phase (4-wire)
- 480-v 3-phase

The flexible primary and secondary cables are connected to overhaul wires from individual storage bins on the top of the truck. Leather "socks" attached to the upper end of the secondary




**600-AMP AMMETERS** show the load on each of three hot secondary legs

## Proves Versatile

cables about 10 ft back from the clamp have "bull rings" that hold the weight of the cable either by hanging from a pole step or tying off on a crossarm.

All internal secondary wiring is No. 2/0 wire. The external secondary cables consist of three 350 MCM (259 strand) and one No. 2/0 (133 strand) rubber insulated power cables, and the primaries are three No. 4, 19 strand 5-kv rubber insulated with Neoprene jackets. Because the secondary cables are expected to carry 40 amp or more, a section of the truck roof, where the cables pass through service entrance bushings, was replaced with stainless steel to eliminate overheating due to hysteresis.

Internal illumination is supplied by the vehicle battery circuit. External red warning lights, for the safety of the public, come on automatically when the primary switches are closed, and are fed by one of the transformers. As a safety measure, the primary switches are closed from the outside with a switchstick.

Three 600-amp ammeters are permanently mounted on the switchboard and are connected to show the load on each of the three hot secondary legs. Voltage testing terminals are also provided.

**WESTERN RED CEDAR POLES**

**They're Safe, Clean to Climb and Deliver Many Added Years of Trouble-free Service**

LIFE-SPAN Western Red Cedar Poles are clean and protected from top-to-butt. They are the result of years of continuous research and are **completely** immune to decay. To serve the utility industry better, Page & Hill maintains three mechanized yards with modern handling equipment. The LIFE-SPAN treatment applied to P&H poles complies with all approved E.E.I. or A.W.P.A. Thermal specifications.

When you buy — specify LIFE-SPAN Western Red Cedar Poles! They're your assurance of longer pole-line service at far less per annum cost.

**PAGE & HILL, Inc.**
**MINNEAPOLIS 3, MINNESOTA**



CIRCLE 87 ON READER SERVICE CARD

ELECTRIC UTILITY METHODS

Eum

**MAINTENANCE & REPAIR**

# Insulated Tools Are Adjuncts

**D. C. HUBBARD**, Chief Engineer, and **O. G. ANDERSON**, Product Manager, Hot Line Tools, A. B. Chance Co

The highly maneuverable insulated aerial platforms or "buckets" permit linemen to move to the most advantageous position for their work and to have a better view of what must be done. Apparatus and intervening conductors become less of an obstruction. Twisting and reaching fatigue is reduced and a lineman's capacity to perform with less strain and greater safety is increased. Add to this the extra safety of insulated tools to isolate the men from energized materials and you permit observance of safe clearances from other circuits and structural members in the work area. Men, tools and materials on most jobs are transported simultaneously to the work area. At work, there is no problem of hanging tools on conductors or laying them across belts. The small tools and materials a man needs can be right at hand in the bucket platform.

### Safety Comes First

The keystone of hot line work is safety and job training. Procedures are built around safe working practices that are as near uniform in their approach to each job as possible. These safe working practices have been adopted from many years of experience with the protection of all linemen and their helpers foremost in the minds of the men who developed the procedures.

Consequently, procedures for one job do not conflict in principle with those of another job and men are carefully trained on these procedures for safe isolation from conductors and apparatus, but where boom supported Fiberglas buckets are used without other insulation between the man and his work, a conflicting set of working practices and safety rules opposite to normal hot stick procedures are necessary.

A man at ground potential must be isolated from energized material. Conversely a man at line potential must be isolated from ground and material at opposing potential. It is notably debatable which situation offers the greater advantage for hot line work and the decision will rest on the specific job to be done. It is possible that the advantage may not lie with one or the other for all situations.

### Insulated Tools Provide Safety

From these considerations it appears that maximum security is achieved by complete isolation of linemen at all times through the use of insulated tools of moderate length when working from buckets. There are very few jobs that can be done on conductors, live or dead, without the use of some kind of tool. Insulated tools offer two important added safety advantages.

1. Safe working clearances from surrounding hazards can be maintained.
2. Uniform work procedures can be established and become routine. The confusion of working part time at ground potential and part

# Remote-Controlled Spray Nozzle

An insulator washing program being carried out by California Electric Power Co, San Bernardino, Calif., is minimizing outages caused by the flashing-over of smog-coated insulators during dense fog and excessive dampness. Furthermore, the program is being carried out safely, economically and effectively through the use of remote-controlled aerial sprayer.

Dust and contaminants carried in smog are deposited on the insulators. As these contaminants build up on the insulators, they become electrical conductors which open a path for high-voltage electricity to flash over the insulators.

Calectric's wash rigs are equipped with high pressure pumps, similar to those used in spraying citrus orchards. The high-pressure nozzles are elevated to a point near the insulators and a pencil-thin spray of pure water is directed to hit them with a force of about 750 to 800 psi. This impact-force breaks the contaminants loose and carries them off.

The water used in washing insulators is tested for purity before it is used, first, to protect the linemen who do the washing

# to 'Hot Line' Maintenance

time at line potential is avoided.

Short hot sticks provide adequate insulation and clearance in areas where bucket trucks can most effectively be employed. This includes urban transmission and distribution circuits, rural lines, and transmission lines readily accessible to mobile units.

Such sticks can be readily stored in compartments on the bucket truck. Tools needed for a given job can be placed in the bucket without interfering with the movements of the man aloft. Here they are conveniently available for use as needed.

**Fiberglas Is Not a Panacea**

The chief enemies of hot stick insulation are moisture and dirt. Fiberglas is popularly regarded as moisture proof and its insulation hazard proof. Because of this, an unwarranted degree of complacency has resulted in scattered accidents of varying degrees of severity. Some men have the conception that simply because they are "insulated" from ground by fiberglas there is no shock problem. Experience is teaching otherwise. Even the best grade of Fiberglas, resin impregnated material must have surfaces that are dry and reasonably clean, internally and externally, in order to be safe for hot line work. Not all grades of Fiberglas have the same degree of resistance to moisture vapor penetration, therefore not the same degree of impedance to leakage currents. Hazards are not limited to earth contact. There are ground potentials on structures. There are conductors and apparatus of opposing potential in most work areas. This is particularly true on so-called "low-voltage" distribution structures carrying multiple circuits where working clearance is limited. For these reasons Fiberglas buckets should not be regarded as adequate substitutes for safe working clearance.

Points uniformly stressed on all "hot" jobs include clean, dry insulation and clearance from energized conductors or equipment. Maintenance crews are taught to keep tools in an area or trailer protected from rain, snow and condensation. They are instructed to keep gloves clean and to store them in protective bags. Ground men know that the surface of a tool should

**HOT-STICKS** attached to the pole are combined with short hand tools used from a bucket to cut deadends for a switch installation on 13.8 kv

be wiped clean before it is sent aloft. Linemen know that tools are periodically inspected for conditions affecting their resistance to leakage currents. Boom structures do not normally receive the care and attention given to hot sticks nor do they receive the same protection from the elements of weather either in storage or transit.

CIRCLE 32 ON READER SERVICE CARD

# Simplifies Insulator Washing

and, second, to protect homes, gardens, automobiles and other property in the areas where the washing operation takes place.

Calectric has a number of washing rigs in service. However, the remote-controlled wash rig which joined the fleet this year, known as a Fabco Hy-Gy, short for high geyser, has a 65-ft telescoping boom which is being used to great advantage. Both the boom and spray nozzle are operated from the cab of the truck. The operator can watch his positions through a glass, equipped with a windshield wiper, installed in the top of the truck's cab. The Fabco Hy-Gy is manufactured by Fab Mfg Co, Inc, Oakland, Calif.

The increasing amount of air pollutants in southtern California's air is reflected in Calectric's battle against smog. Ten years ago, according to J. K. Reaves, Calectric's superintendent of transmission, it wasn't necessary to wash insulators. Today, the three aerial lift units are kept busy in an ever-widening area at least eight months out of the year.

CIRCLE 35 ON READER SERVICE CARD

*(More Maintenance on page 90)*

# New point-a-second alarm scanner

*scans or records up to 200 variables*
*to detect off-normal conditions fast*

The Dynamaster® Alarm Scanner combines high-speed scanning of any type of variable, continuous or off-normal recording, and multiple-alarm settings in a single monitoring instrument.

Check these Dynamaster capabilities against your alarm scanning requirements:

**Positive alarm notification,** provided simultaneously by:
(1) illuminating a red "alarm lamp" on instrument case
(2) energizing external visible and audible alarm signals
(3) automatic print-out of measured value and identification of the off-normal variable.

**Alarm flexibility.** Up to 20 individually adjustable potentiometers can be provided—permitting separate high and low settings for each of 10 variable groups.

**Simplified operation.** Any high- or low-alarm limit can be changed within 5 seconds. All operator selector switches are mounted on face of instrument. Scan cycle is traced by lamps on front of Scanner case.

**Long instrument life** is insured by transistorized design and precision mechanical construction. To prevent unnecessary wear, Dynamaster servo-balancing mechanism remains inoperative during scanning until an alarm condition is detected.

For complete details on these and other features of the new Dynamaster Alarm Scanner, write to: 119

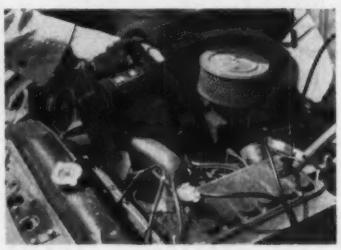
**THE BRISTOL COMPANY**
Waterbury 20, Connecticut
*Or nearest Bristol Branch Office*

BRISTOL'S
THE DATA-MASTER CORPORATION
*Subsidiary of The Bristol Company, Waterbury 20, Conn.*
ACCO

90 CIRCLE 90 ON READER SERVICE CARD

## Hinge on Cover Plate Simplifies Opening

Changing a junction box cover plate to a door by putting it on a hinge has eliminated the job of removing 20 stud bolts every time the junction box is opened. The change has also eliminated the hazard in opening the junction box which is 15 ft above the turbine room floor. With the hinge installed, there is no problem of dropping either bolts or plate.



## Magnet Spots Defects

Defects within ferrous metal machine components, such as an engine block, turbine blading, etc., can readily be detected with Westinghouse Electric Corp's new portable magnetic detector.

The new unit operates from an auto battery, or on standard household current. First a special powder is sprayed onto the surface of the metal part to be inspected. The magnetic detector creates a magnetic field which discloses any cracks or defects by forming telltale patterns in the powder.

*(More Maintenance on page 92)*

CIRCLE 33 ON READER SERVICE CARD

# INTRODUCING THE L-32 and L-36 ASPLUNDH LINE LIFTS

## *Completely Insulated By*

- **Basket Liner**
- **Fiberglass Boom**
- **Pylon Mast Insert**

Here are the new medium duty Asplundh Line Lifts, L-32 and L-36, offering you greater efficiency and economy. We stress their articulating action which enables you to obtain a greater variety of working positions in fast, safe movements.

These new medium duty models are ideally suited for overhead line maintenance and street light maintenance, yet economically priced. They are completely versatile and quickly positioned without the use of outriggers.

The Asplundh L-32 and L-36 have outstanding safety features, and are the most completely insulated aerial devices available. They have a dependable control system, and can be easily mounted on a selection of chassis.

Study the specifications, the positive safety features and outstanding performances, and you'll see why Asplundh gives you maximum application.

**Following are the specifications of the new Asplundh L-32 and L-36 Line Lifts.**

| The ASPLUNDH L-32 | The ASPLUNDH L-36 |
|---|---|
| Convenient Working Height: 37′ | Convenient Working Height: 41′ |
| (Ground to bottom of basket measurement 32′) | (Ground to bottom of basket measurement 36′) |
| Horizontal Reach: 24′ | Horizontal Reach: 27′ |
| Road Clearance: 9′-6″ | Road Clearance: 9′-6″ |
| Stabilization: Torsion Bars | Stabilization: Torsion Bars |
| Upper Boom Travel: 230° | Upper Boom Travel: 230° |
| Lower Boom Travel: 90° | Lower Boom Travel: 90° |
| Rotation: 360° | Rotation: 360° |
| Insulation Rating: 50 KV Plus | Insulation Rating: 50 KV Plus |
| Moulded Fiberglass Basket with Liner | Moulded Fiberglass Basket with Liner |
| Pylon Insert Available | Pylon Insert Available |
| Power Source: Power Take-Off | Power Source: Power Take-Off |
| Chassis: 14,000 lb. G.V.W. 4,300 lb. Cab Chassis Weight | Chassis: 14,000 lb. G.V.W. 4,700 lb. Cab Chassis Weight |

*For Additional Information Contact:*

**ASPLUNDH Chipper Company**

**Hamilton St., Chalfont, Pa.**



CIRCLE 91 ON READER SERVICE CARD 91

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Shockgard

Mine Safety Appliance's Shockgard and accessories give electrical and impact protection with safety and comfort . . . full head protection to electrical workers. Every Shockgard hat and cap is factory tested at 20,000 and 30,000 volts and voltage protection is unimpaired through temperature ranges of under −25° to over +200°F. All fittings are plastic . . . no metal parts which might conduct electricity. Shockgard hats and caps and other MSA equipment are available through Graybar . . . another reason to call Graybar—for everything. Graybar Electric Company, Inc.: local service to utilities through coast-to-coast warehousing.

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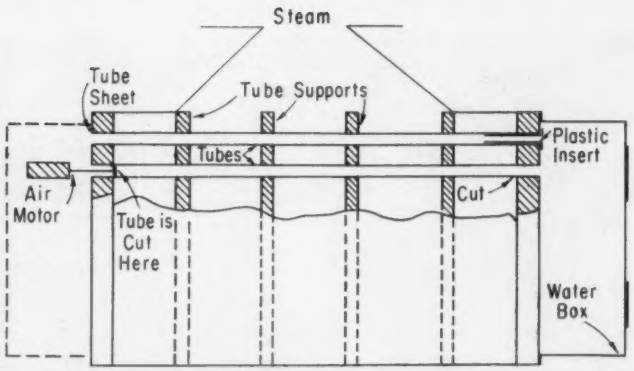



**AIR MOTOR** cuts ends from condenser tubes, facilitates tube removal without other damage, thereby permits maximum salvage savings as detailed below

# New Technique Salvages Condenser Tubes

**W. A. WHITTEN,** Superintendent, Neches Station, Gulf States Utilities Co, Beaumont, Tex.

New techniques in condenser tube salvage have resulted in savings to Gulf States Utilities Co of over $100,000.

Tube corrosion and failure became a problem following a severe drought and pollution of the Neches River in 1956. Tube failures were more numerous on the inlet ends, which was attributed to the higher potential gradient at this location. To eliminate this problem, plastic inserts, 12 and 8 in. long, were installed in the inlet and return ends respectively. This stopped tube failures for approximately two years. However, erosion due to turbulence at the ends of the inserts caused sufficient thinning of the tubing to require re-tubing of the condenser after four years of service. When the tubes were removed, a weight loss test indicated only 20% metal loss—indicating that the tubes could be used elsewhere if removed without damage. Therefore, a new technique was developed for removing old condenser tubes.

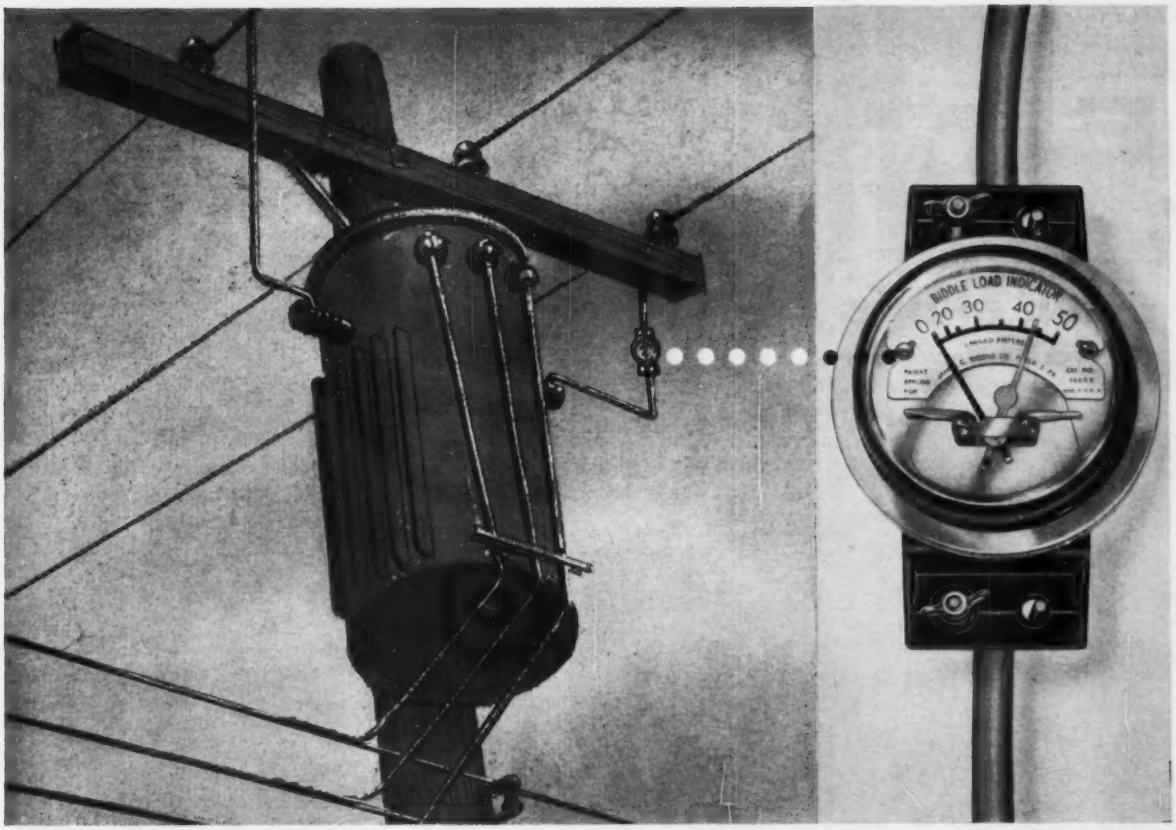
A reversible air-driven cutting tool was projected into first one and then the other of the tube ends to a depth equal to the thickness of the tube sheet—thereby cutting the tubes from the tube sheets. With the tubes cut loose from the tube sheets, one tube sheet was removed, affording free access for the tubes to be removed. The salvaged tubes are expected to give an additional five to seven years of service. The recovery value of the tubes is based on the data below.

The Neches Station No. 5 turbo-generator unit condenser has been re-tubed with the tubes removed from Unit No. 7. The tubes removed from No. 5 condenser will be salvaged for re-use in another condenser requiring still shorter tubes with very similar capital cost savings. The value of these tubes for re-use is estimated at approximately $50,000 in useful life.

CIRCLE 34 ON READER SERVICE CARD

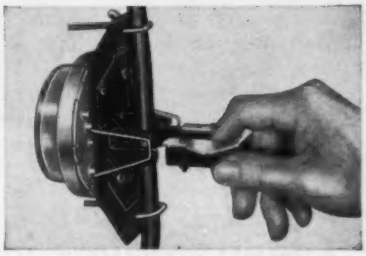
**Cost Data for Salvage Tubes at Neches Station No. 5**

| | | |
|---|---|---|
| **Total weight of old tubes.....(116,541 lb)** | | |
| **Price of new tubes.....(0.8281¢/lb)** | | |
| Estimated value on weight basis..... | $96,500 | |
| Estimated life loss of original tube—20%..... | | 19,300 |
| Cost of removing tubes..... | | 3,000 |
| Cost of preparing tube ends..... | | 2,500 |
| Cost correction for tube length loss..... | | 12,900 |
| Salvage value of cut-off portion..... | 1,800 | |
| | $98,300 | 37,700 |
| Estimated value of tube for re-use..... | $60,600 | |




# The BIDDLE LOAD INDICATOR

## ...provides a practical means for determining distribution transformer loading



. . . makes system monitoring economically sound through—low unit cost—minimum installation time and labor—no electrical connections or disconnections—no tools required.

Install Biddle Load Indicators for the life of your distribution transformers—they're rugged and completely conditioned for all weather and climates—and they are reliable in their performance.

The Biddle Load Indicator is, very simply, a demand ammeter with a 30-minute lag for indicating peak load. *It indicates the magnitude of the load,* not just a signal of a predetermined overload.

A red, maximum reset pointer indicates maximum value obtained since previous reset and is reset simply by passing a magnet across the face of the glass scale cover.

The black indicating pointer follows current changes, indicating the preceding 30-minute load continuously.

The Biddle Load Indicator will provide more of the nature and magnitude of actual transformer loads than has been obtainable before except by costly and prohibitively time-consuming methods.

Complete system load-monitoring is possible and economically sound with this simple but reliably accurate instrument.

**For complete details write for Bulletin 50W.**

B113

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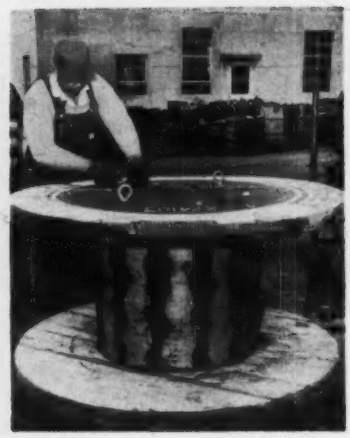
CIRCLE 93 ON READER SERVICE CARD 93

ELECTRIC UTILITY METHODS

Eum

**STORES & SHOPS**

**BUILT-UP REEL** is assembled after wire is dropped off tapered core



**BUILT-UP REEL** is bolted together. Eyelets are for separating reel

# Built-Up Reel Eases Handling of Salvage Wire

A tapered core reel with a removal side is simplifying the task of handling salvage wire at the Seattle (Wash.) Department of Lighting.

It is very little trouble in the field to reel up the obsolete wire for removal to the salvage yard, however, when a reel of salvage wire arrives at the yard it is often a time consuming frustrating chore to remove the wire from the reel. This problem was resolved when Gordon Grayson, foreman in charge of Seattle City Light's salvage section, developed a built-up reel.

The salvage reel is comprised of a shop-fabricated, welded reel core, two reworked standard-reel sides, plus hardware. The welded reel core is tapered so that it may easily be pulled out from the coiled wire at the salvage yard. One side of the reel is bolted permanently to the core—this side contains two eyelets to which the salvage crane is hooked when separating the reel. The second side of the reel is assembled to the core with six 1-in. bolts. These bolts are inserted first through the permanent side, then through the core, and finally through the temporary side to engage six nuts, permanently fixed in the outer surface of the "removable" side.

**REMOVABLE SIDE** contains six nuts welded to bolt fastened plates

# Clean Gloves in Electric Washer, Dryer

Rubber gloves are washed and dried safely and conveniently by Oklahoma Gas & Electric Co in an electric washer and dryer. Using the standard cycles in the two appliances, about 30 gloves may be handled at one time.

Standard, lowest-cost residential type appliances are used in the operation. To maintain the maximum recommended drying temperature (125F), it was necessary to reconnect the dryer so that 120 v is placed across the heating elements on the machine's "low" setting. With this modification, air temperature does not exceed 125F anywhere in the dryer.

Gloves are washed in plain, warm water without detergent during the regular wash-rinse-spin cycle. Gloves then are dried for about 30 min, after which they are inspected and given a final drying for about 1 hr. Tumbling action of the dryer removes water from inside gloves.

# KLEIN NYLON SAFETY STRAPS

Since Klein developed the first fabric safety strap for linemen—Klein-Kord—Klein has pioneered every improvement in safety straps. Now Klein can offer the widest variety of safety straps on the market, including Klein-Kord Nylon Safety Straps with these improved features:

**LONG LIFE** Superior construction woven from filament nylon. No permanent stretch at any load.

**PERFORMANCE** Klein Nylon Safety Straps meet all requirements of EEI Specifications and under actual test will outperform any competitive strap at least 3 to 1.

**FLEXIBILITY** Unlike many fabric straps, Klein-Kord safety straps are extremely flexible, combining maximum comfort with greatest strength.
When tested in use, they are capable of a test load of 2750 pounds, far in excess of any they will be called upon to support in service.

**BUCKLES AND SNAPS** All buckles and snaps are drop-forged and tested by Klein in its own forge shop.

**Write for Bulletin 560**

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ELECTRIC UTILITY METHODS

**Eum SAFETY**

# Guard Against Second Contact

**A. R. COWAL**, Distribution Superintendent, Ohio Power Co, Canton, Ohio—AEP System

When an accident occurs involving an electric shock to a lineman working on a pole, the first question usually asked by many is, "What was the primary voltage?" An analysis of vital statistics indicates that perhaps a more appropriate question might be, "What object or equipment made the second contact with the victim's body?"

The above remarks are not intended to minimize the importance of the proper use of protective equipment and procedures involving the hands and the upper portions of the body when working in energized areas. The intention is, rather, to stress to the utmost the absolute necessity for adequate protection for the entire body.

The fundamental theory, "a minimum of two contact points at different potentials are required to complete an electric circuit," should be respected at all times by every lineman throughout his work. A lineman who does not guard himself against the possibility of two contact points is only about half safe. Any protective scheme which does not guard against all possible contact with the body is not adequate.

To stress the importance of this theme, one has only to review the data compiled by the Edison Electric Institute. During the period from 1951 to 1959, there were 1,065 fatalities in the electric light and power industry. Of these, almost 400, or nearly 40%, resulted from electric shock to linemen while working on poles.

A summary of the industry-wide statistics shown reveals that 214 of the 393 exit or low-potential contacts, or 54%, involved the foot or leg. In other words, the foot-and-leg combination seems to be a common denominator insofar as exit contacts are concerned. This is easy to understand since a lineman is either standing on equipment that can be contacted, or his feet are within contacting distance.

The summary graph shows the equipment and objects involved in these exit contacts. The equipment most frequently contacted is the common neutral, secondary conductors, ground wire, transformer cases, poles, guy wires, etc. This reveals without any doubt the absolute necessity for guarding the body against electric contact with such equipment.

The most significant deduction which can be made from the analysis of these vital statistics is that many of the fatalities would not have occurred if the linemen involved had guarded themselves against the second contact.

All of the above should serve as a reminder that linemen working live on lines by **traditional methods** should:

**1.** Cover all live conductors within reaching distance.

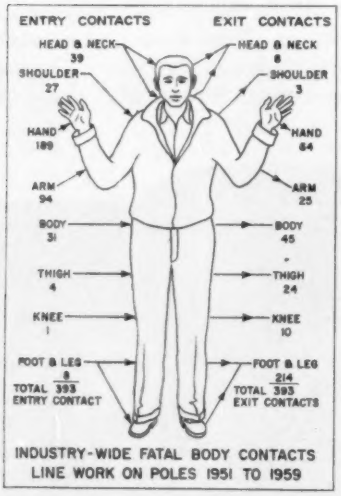
**2.** Wear rubber gloves and sleeves at all times when in the "primary area."

**3.** Cover all grounds, foreign wire attachments, and conductors within the working area.

**4.** Wear linemen's overshoes and/or use insulated working surfaces when working on conductors above 200 v.

Items 1, 2, and 3 apply when using "bare-hands" method (EW, Dec. 19, p 76) **only when safe clearance distances cannot be maintained.** Item 4 does **not** apply to the "bare-hands" method.

Each lineman's safety will be assured if he maintains constant awareness of the fact that it requires two contacts to complete a circuit, and if he always protects himself from the possibility of making the second contact and completing a circuit. This principle applies equally, as well, to "bare-hands" live-line maintenance. It is highly important that all parts of the body be kept at one potential, whether conductor potential or ground potential. It is the second contact, at another potential, that produces the voltage difference that can cause currents to flow.




INDUSTRY-WIDE FATAL BODY CONTACTS
LINE WORK ON POLES 1951 TO 1959

**INDUSTRY-WIDE** statistics compiled, starting in 1951, classify accidents involving shocks or burns according to points of entry and exit of current. By definition, point of entry is point of contact with higher voltage, while point of exit is point of contact with lower voltage or ground potential

**Equipment Contacts At Exit Points While Working on Poles (1951-1959 Fatalities)**

| | |
|---|---|
| Neutral Pri. or Sec. | 86 |
| Secondary Wires | 60 |
| Ground Wires | 48 |
| Transf. Cases, Hgrs. | 41 |
| Poles | 53 |
| Guy Wires | 44 |
| Telephone Wires | 15 |
| Braces | 9 |
| St. Light Circuits | 7 |
| Steel Towers | 6 |
| Bolts | 6 |
| Switch Frames | 2 |
| Secondary Racks | 4 |
| St. Light Brackets | 2 |
| Chains | 3 |
| Conduits | 2 |
| Cutouts, Trees, Steel Arms, Racks, Coffin Hoists (each) | 1 |

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ELECTRIC UTILITY METHODS

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## COMMUNICATION

**IGNITION SUPPRESSION . . .** for two-way-radio-equipped vehicles operated in fleets. Techniques in suppression presented to "clear up the incompatibility" between radio man and mechanic on the amount of suppression a vehicle can endure. Also illustrates to the radio technician the importance and function of the ignition system and spark plugs. Booklet, 16 pages. Champion Spark Plug Co, 900 Upton Ave, Toledo 1, Ohio **(151)**

**RADIO ALARM CONTROL . . .** details the TRACE, or Thiokol Radio Alarm-Control Equipment as it performs monitoring and supervisory functions for utilities as authorized by Federal Communication Commission Regulations. Folder with ten tuck-in separate data sheets on various aspects of the system. National Electronics Division, 1713 Kalorama Rd, NW, Washington, D. C. **(152)**

**ALARM SYSTEM . . .** the Marc 3000 and Marc 4000, providing for continuous transmission of data regarding operation of remotely located apparatus. Microwave alarm and control systems with completely solid-state circuits with capacity of 65 alarm reports per sec described in Bulletin, "Microwave Alarm and Control Systems," four pages. Moore Associates, Inc, 893 American St, San Carlos, Calif. **(153)**

## CONSTRUCTION

**WIRE PULLER . . .** used on particularly long pulls, adjustable to the load. Describes Porta-Puller as tool for faster wire pulling through all sizes and types of conduits, with mechanical advantage up to 115 to 1; cable with guaranteed strength of 2,000 lb. Bulletin, two pages. Fairfield Industries, Inc, Passaic Ave and Pier Lane, Caldwell, N. J. **(154)**

**BACKHOE . . .** for Caterpillar wheel loaders, the Ottawa LX Hydra-Hitch, a quick disconnect attachment. Features detailed for operation on level or rough terrain, also dirt ejector buckets. Folder, Form No. CLX-7112, four pages. Young Spring & Wire Corp, Bowling Green, Ohio **(155)**

**HAULING/DUMPING TRUCK . . .** off-the-road applications depicted in photographs of both the overall unit and its internal components. Details on die-cast aluminum engine, wheels and tires, suspension system, clutch, transmission, power train and brakes. Bulletin, "Haulster," two pages. Cushman Motors, Lincoln, Neb. **(156)**

**HORIZONTAL BORER . . .** capacity chart and details given on G-160, gasoline engine driven boring unit with range from 200 ft (12-in.-dia hole) to 150 ft (36-in. hole on the horizontal or at angles up to 30 deg from horizontal). Bulletin, six pages. Kwik-Mix Co, Port Washington, Mo. **(157)**

## INSTRUMENTS

**INSTRUMENT RELAYS . . .** general-purpose line GH Series with six types. Specifications, typical applications and dimensional drawings, also a chart illustrating contact symbols and designations for all basic contact arrangements listed by National Assn of Relay Mfrs. Booklet, eight pages. Elgin Advance Relays, Electronics Div of Elgin National Watch Co, 2435 N Naomi St, Burbank, Calif. **(158)**

**TEST UNIT . . .** for distribution transformers, Models TTS-50 and TTS-250, portable and completely self contained for transformers of 50 kva or less and through 250 kva, respectively, detailed in two-page bulletin. SB-TTS-1, two pages. Multi-Amp Div, Multi-Amp Electronic Corp, Cranford, N. J. **(159)**

**LEAK DETECTORS . . .** describes Type H line of portable, halogen sensitive, electronic leak detectors. Types include Type H-2, gun detector; Type H-5, pencil probe detector for inspection of welds, seams, joints and other suspected areas of leakage in pressure systems; Type H-3, stationary detector for completely automatic production line leak testing; and Type H-4, vacuum detector for vacuum system leak checks. Bulletin GEA-6817A, eight pages. General Electric Co, Schenectady 5, N. Y. **(160)**

**PANEL INSTRUMENTS . . .** line of Model 911-912 ac and dc voltmeters and ammeters, combination portable/panel instruments are described and illustrated. Installation data, dimensions, details of components provided. Bulletin No. 06-209, two pages. Daystrom, Inc, Weston Instruments Div, 614 Frelinghuysen Ave, Newark 12, N. J. **(161)**

**PROCESS INSTRUMENTS . . .** describes Series 88 pneumatic controllers, transmitters and receivers designed to control and transmit flow, pressure, liquid level and other continuous process variables. Features for simplifying adjustments, decreasing maintenance and providing increased adaptability detailed and illustrated. Bulletin 406. American Meter Co, 920 Payne Ave, Erie 6, Pa. **(162)**

## POWER PLANTS

**SPEED-MEASURING SYSTEMS . . .** complete line of ac and dc tachometer generators and indicators in wide variety of types, sizes and accuracy classes. Each tachometer system—consisting of a generator plus an indicating and/or recording instrument—described. Applications and method of selection covered. Schematics and photos included. Bulletin GEZ-3251, 12 pages. General Electric Co, Schenectady 5, N. Y. **(163)**

**BOILER FEEDWATER TREATMENT . . .** question-and-answer analysis covers fundamentals. Appendix contains data used in water chemistry; water analyses; and conversion factors. Bulletin 30, 24 pages. Nalco Chemical Co, 6216 W 66 Place, Chicago 38, Ill. **(164)**

**FEEDPUMP RECIRCULATION . . .** control system delineated as using temperature difference (employing temperature rise of feedwater through feedpump to regulate ample recirculation flow for pump protection. Technical treatment, augmented by photographs and drawings. Bulletin MSA-196, eight pages. Hagan Chemicals & Controls, Inc, Pittsburgh, Pa. **(165)**

**AIR COMBUSTION HEATERS . . .** for power-stations: heavy-duty, removable core coil construction and tapered Aerofin tubing described and illustrated, as well as steam-heating and hot-water-coil designs. Bulletin FD 800, four pages. Buffalo Forge Co, Buffalo 5, N. Y. **(166)**

**HEAT EXCHANGERS . . .** describes design features of Type CP (6 through 31 in.) and Type CPR (6 through 17 in.); furnishes tables on dimensions of standard two-pass and single-pass tubeside arrangements, with each dimension keyed into accompanying illustration. Bulletin No. 302.1K1, 12 pages. American-Standard Industrial Div, Detroit 139, Mich. **(167)**

**DRILLING MACHINE . . .** Model MDS-400 Diamond Masonry unit, for holes from 1 to 6½ in., equipped with two-speed electric power unit with built-in waterswivel. Description of vacuum base available, featuring patented double-gasket sealing principle. Bulletin, four pages. Sprague & Henwood, Inc, Scranton, Pa. **(168)**

*(More Literature on page 100)*


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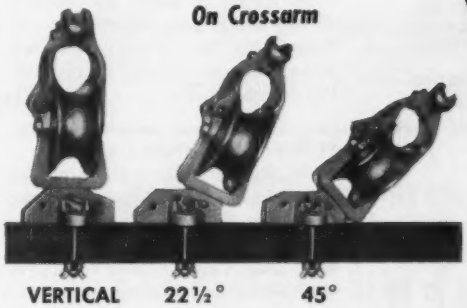
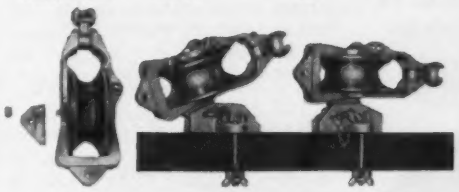


VERTICAL 22½° 45°



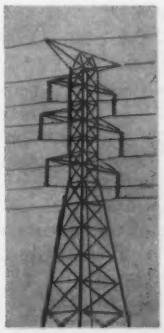
67½° 90°

*On Crossarm With Added Angle Attachment*

*In Suspension*

*With Pole Bracket*

*67½°-90° Angle Attachment and Pole Bracket are accessories.*



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- Checks current-carrying elements of circuit breakers without disassembling
- Isolates cause of high-resistance circuits; reveals corroded or loose connections, bad contacts
- Indicates loose or corroded field lead connections (especially internal shaft) in normal overhaul of synchronous condensers
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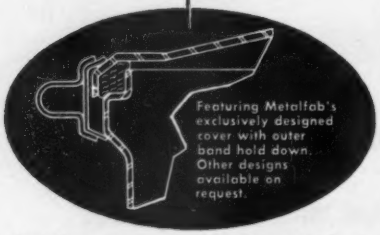


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**RUST PREVENTIVE . . .** Ospho metal treatment, with description of application on rusted metal to stop rust action and provide inert, hard surface for regular maintenance paint. Folder, Ospho, four pages. Rusticide Products Co, 3125 Perkins Ave, Cleveland 14, Ohio **(169)**

**SAND BLASTER . . .** details on Sandy Jet Model B tool for fast cutting, abrasive-type cleaning for use anywhere there is an air line available. Pistol-Grip type blast gun described, abrasive container and abrasive material. Bulletin, two pages. Universal Industrial Supply Co, Box 6764, Columbus 9, Ohio **(170)**

## TRANSMISSION

**DISCONNECT SWITCHES . . .** outdoor, with construction and application features on hookstick and group-operated, 7.2 to 345-kv units, including single and double-throw, single and multipole types. Bulletin 36-250, 20 pages. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. **(171)**

**SUSPENSION INSULATORS . . .** 10-in., with aluminum cap-and-stud design described. Discusses forged aluminum alloy hardware feature—which makes construction and maintenance easier, also covers reduced radio noise, rapid heat dissipation under surges, quality control and testing. Bulletin. 12 pages. A. B. Chance Co, Centralia, Mo. **(172)**

**INSULATORS . . .** two new lines of Locke stacking station post insulators, 550 to 1,470 kv, fully described and illustrated as to construction and special features. Photographs, line and cutaway drawings and a table of characteristics included. Bulletin TIA-184, four pages. General Electric Co, Schenectady 5, N. Y. **(173)**

**SWITCHES . . .** two types of wood-pole mounted, Alto and Savar switches, side-break are illustrated and discussed: Alto, upright mounted switches; and Savar, horizontally mounted switches. Dimensions listed for ratings 34.5 through 138 kv, both 600 and 1,200 amp. Bulletin 1130B, 12 pages. I-T-E Circuit Breaker Co, Greensburg, Pa. **(174)**

- Easily portable
- No jacks
- Handle any reel diameter
- Heavy steel frame
- Slanted front
- Ball-bearing, adjustable rollers
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Load cable, wire, rope or anything on reels onto Roll-A-Reel for easy, smooth pay-out or take-up.

*All are drilled for optional auxiliary ball-bearing side rollers, $5.00 per set extra.*

**STYLE A**

2,000 lbs. cap. for reels up to 28" wide. Weight 60#.
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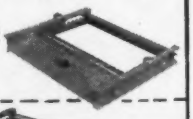

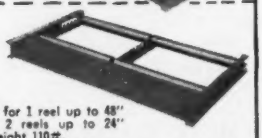

**STYLE B**

4,000 lbs. cap. for 1 reel up to 48" wide; or for 2 reels up to 24" wide each. Weight 110#.
PRICE $84.50
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• Special sizes on request.

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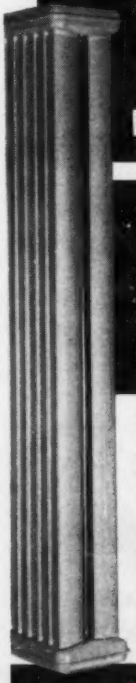

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**OIL CIRCUIT BREAKERS . . .** distribution, 5-cycle, Type OZ, for 14.4 and 23 kv, 250 and 500 Mva, 600 and 1,200 amp. Descriptions of tank-per-phase construction, solenoid or stored-energy operator, and cross-blast interrupters. Block drawings of construction features which are said to be found normally only in transmission breakers, also reference table of general dimensions, ratings. Bulletin 71B9705, eight pages. Allis-Chalmers Mfg Co, Milwaukee 1, Wis. **(175)**

## WIRE & CABLE

**CONDUCTORS . . .** standards for aluminum electrical conductors, wire and stranded—bare. New data on conductors, core wires, cable reels, and conductor lengths issued to supersede standards issued in July, 1956. Also, for the first time by Alcoa, information on 5005 aluminum alloy conductors; aluminized steel core wire for aluminum conductor, steel reinforced; and details on expanded ACSR in new size: 2,294 MCM, 2.32-in. dia. Conductor cross-section diagrams and reel and coil data. Section DA2A, 24 pages. Rome Cable Division, Aluminum Co of America, Rome, N. Y. **(176)**

**SERVICE DROP CABLE . . .** describes Olin's Compresto cable for overhead service, to which E. I. du Pont de Nemours & Co, Inc's Hypalon insulation is applied—a synthetic rubber which resists weather, heat, oxygen and ozone, is rated at 600 v. Physical property listing of Hypalon/Compresto cables, rated for continuous 75C conductor operating temperature, threshold damage temperature in excess of 200C. Permanent color coding of cable indexed; phase wires of duplex and triplex cable size identified. Bulletin, four pages. Olin Mathieson Chemical Corp, Chattanooga, Tenn. **(177)**

**WIRING CONDUIT . . .** flexible, liquid-tight, Sealtite, with specifications on diameter, weights, descriptions of four types. Underwriters listing. Bulletin No. 5-544, four pages. Also, new meter miter-box type cutting jig for the conduit, portable, attached to vise or bench. Bulletin, one page. Anaconda Metal Hose Div, Anaconda American Brass Co, Waterbury 20, Conn. **(178)**

*(More Literature on page 102)*


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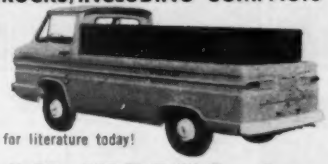

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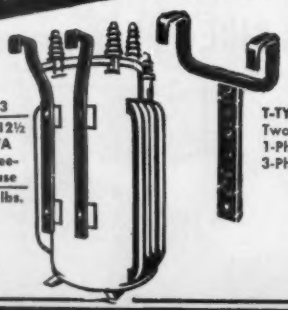

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## W & C ACCESSORIES

**WEDGE CLAMPS . . .** for service cable dead-ends are covered in engineering and construction detail. Three types are described: all aluminum, chromated aluminum for highly corrosive areas, and stainless steel for copper neutral service drops. Also performance charts and ordering data. Bulletin No. 6105, four pages. Jasper Blackburn Corp, 1525 Woodson Rd, St. Louis 14, Mo. **(179)**

**WIRING REELS . . .** variety of wire and cable-measuring equipment, including portable one-man cable puller. Catalog bulletin, 10 pages. HyKon Mfg Co, 163 E State St, Alliance, Ohio **(180)**

**TUBULAR ACCESSORIES . . .** compression, for overhead conductors, revised and expanded edition. Accessories for several types and sizes of conductors: ACSR 336.4 MCM 26/7 to 1,590 MCM 54/19; stranded aluminum, 450 MCM to 1,590 MCM; galvanized steel strand, $\frac{3}{8}$ in. to ½ in.; and Alumoweld strand, three No. 10 to seven No. 5. Installation methods featured with explanatory sketches. "Advanced Design Tubular Accessories of Overhead Conductors," 40 pages. Rome Cable Division of Aluminum Co of America, Rome, N. Y. **(181)**

**RIGID CONDUIT . . .** describes new line of rigid PVC plastic pipe, newly approved for use as electrical conduit. Complete specifications and suggested applications for the non-conducting, non-corrosive ½ to 6-in.-dia plastic conduit, which is listed by Underwriters' Laboratories, Inc, for direct underground burial or encasement in concrete. Brochure, eight pages. Lasco Industries, 1561 Chapin Rd, Montebello, Calif. **(182)**

**CABLE SUPPORT SYSTEMS . . .** delineates selection and installation of right section, type of bend or component part for supporting power cables, communication cables and automatic control or hydraulic line cables. Illustrations and descriptions of how, without use of bolts, nuts, washers or pins, each component piece becomes a part of both simple and complicated cable support installations. Booklet No. 106, 52 pages. Chalfant Products Co, Inc, 11525 Madison Ave, Cleveland 2, Ohio **(183)**

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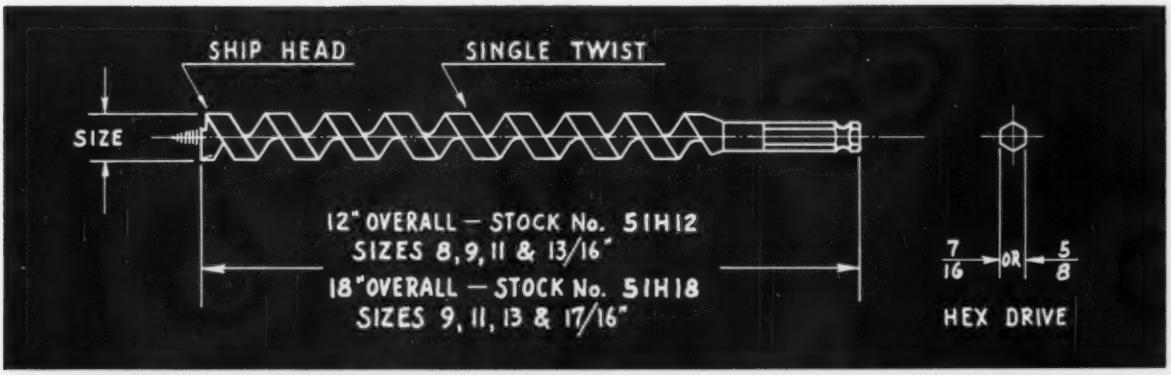


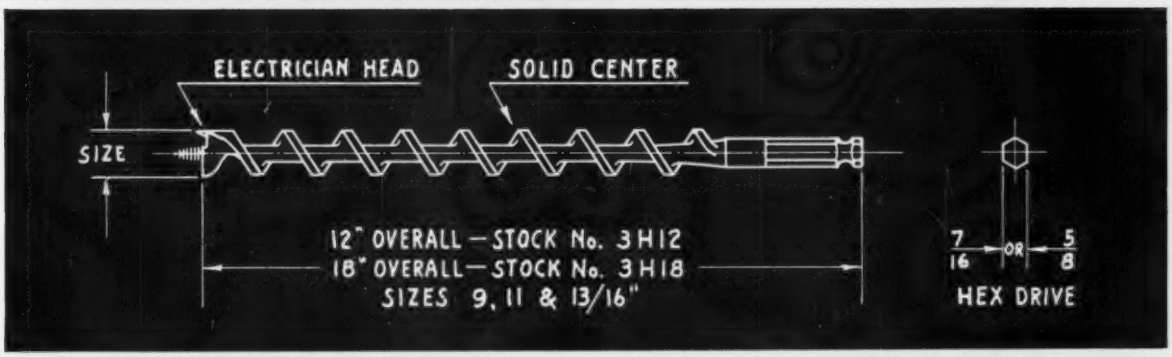


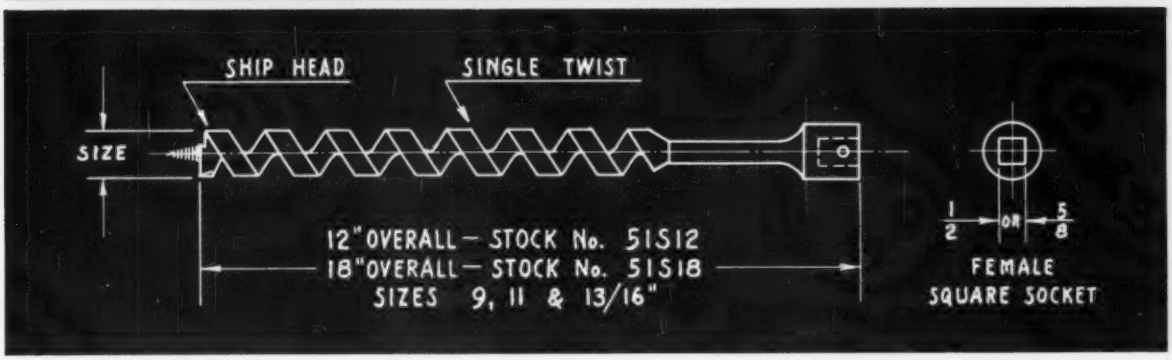


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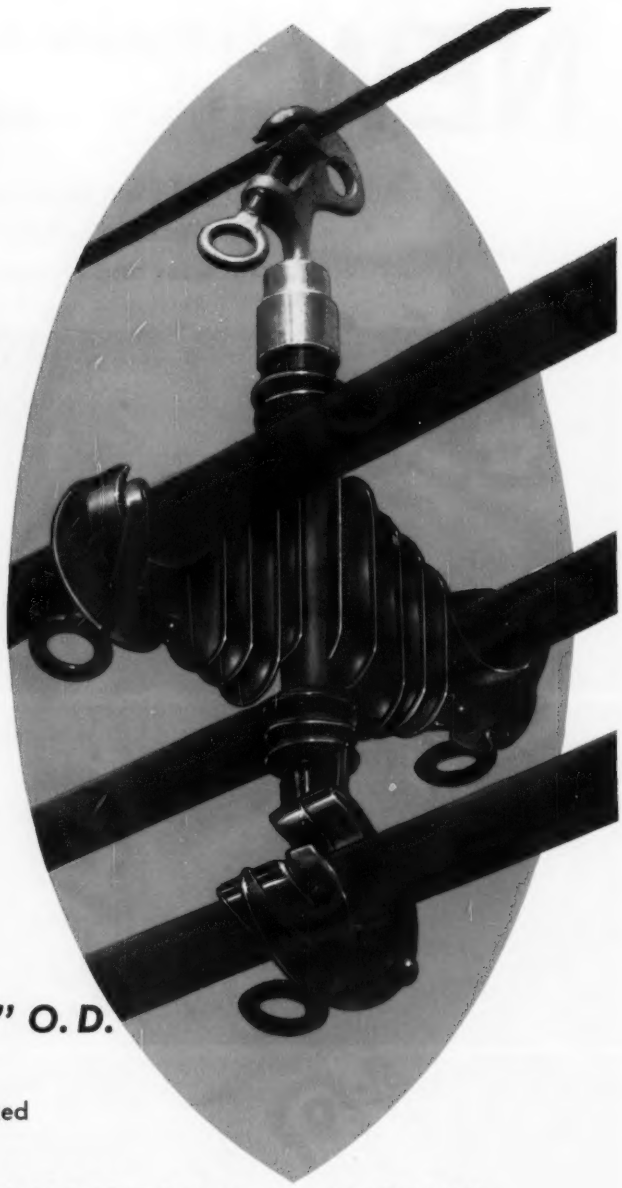

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# Lapp Introduces 1,000-Lb Station Post Units

Taking advantage of extra-conservative strength margins in the design of station post insulators, as well as progressive improvements in ceramic technology in recent years, Lapp Insulator Co has introduced a new series of station post insulators for 7.5 through 69-kv service having a 1,000-lb cantilever rating.

Although smaller in diameter and lighter in weight than EEI-NEMA standard-strength units in this voltage range, the new post insulators are otherwise identical in height, mounting dimensions and electrical characteristics. However, the cantilever strength rating in both upright and underhung positions is 1,000 lb instead of 2,000 lb for standard strength station post insulators. Thus, the rating of the new insulators not only matches the conventional cap-and-pin switch insulators in cantilever strength, underhung, but also is physically interchangeable with standard-strength station posts.

Weight of the new 1,000-lb station posts is about 20-25% lighter than the 2,000-lb standard-strength units, depending on voltage rating.

Lapp's new so-called Hi-F station posts, like its line of Hi-F 9-in. disc insulators, announced in July, represents a break by the company with industry standards for insulators. It is also described as an effort to tailor insulator designs more closely to the majority of strength requirements encountered in the field, and to pass on resulting cost savings.

The manufacturer points out that for the vast majority of installations the new 1,000-lb rated insulator is far more than adequate. For cases where, due to high short-circuit stress, or for other reasons, high strength is desirable, station posts in 2,000, 4,000 and 8,000-lb ratings will continue to be available. Moreover, it is stated that modern switches do not require high strength or excessive rigidity and that the new post design should serve every need of most substation installations at a substantial savings.

**SNEAK PREVIEW** of new 7.5 to 69-kv station post insulators is given Rochester Gas & Electric Co's George Fielder by Brent Mills, Lapp Insulator Co. New units have 1,000-lb strength, are smaller in diameter and lighter than standard units, otherwise are the same

**MODEL OF 670-MW** Chalk Point Plant is examined by R. Roy Dunn (left), president of Potomac Electric Power Co, and S. T. MacKenzie (second from left), B&W's vice president in charge of boiler division sales. With them are G. Bisset, Pepco senior vice president, and L. W. Cadwallader (right), vice president of Pepco's engineering, construction and operations. Boilers are rated at 3,500 psi, 1,000/1,050/1,000 F

# Order B&W Boilers for New 670-Mw Station

An order for two huge Universal Pressure boiler systems, capable of generating a combined total of 5 million lb of steam per hr, has been awarded to Babcock & Wilcox Co by Potomac Electric Power Co, of Washington, D. C., it was announced recently by R. Roy Dunn, Potomac Electric president, and S. T. MacKenzie, B&W vice president in charge of boiler division sales.

The boilers, scheduled to go into operation in 1964 and 1965, highlight the $105-million, 670-Mw Chalk Point Station to be built by Potomac Electric in Prince George's County, Md.

The utility's order to B&W specifies two boilers, each designed to generate 2,500,000 lb/hr steam at 3,500 psi, 1,000/1,050/1,000F. The new Chalk Point boilers will develop a total of 670 Mw. This will increase Potomac's over-all generating capability from 1,453 Mw to 2,123 Mw, and will increase its generating stations in the Washington, D. C.-Maryland area to five.

(*More News of Manufacturers on page* 108)

# New Transformer Insulation Announced

Dr George M. Anderson, president of the Thomas A. Edison Research Laboratory division of McGraw-Edison Co, recently announced an improvement in transformer insulation constituting a development of major importance to the multi-million-dollar power and distribution transformer industry. Dr Anderson and associate research scientists disclosed details of the new Edison modified kraft insulation, called TherMEcel, and said that the improved insulation has been made available to other McGraw-Edison divisions. Dr Anderson also announced that consideration is being given to making Edison modified kraft available to other companies through licensing agreements.

Berthal D. Brummet, director of the insulation project, described criteria and tests used in evaluating the new transformer insulation.

- Toughness: A comparison of absolute values for toughness between Edison modified kraft and electrical grade kraft shows that the initial toughness factor of Edison modified kraft is double that of electrical grade kraft. After aging, Edison modified kraft is many times tougher than electrical grade kraft.
- Tensile Strength: A comparison based on 60% tensile strength retention shows a life of 15 days for electrical grade kraft versus 50 days for Edison modified kraft when aged at 150C.
- Tear Strength: Using 50% tear retention for comparison, electrical grade kraft has an eight-day life as against 46 days for Edison modified kraft when aged in oil at 150C. A similar comparison for tear retention, with aging in oil at 170C, shows an even more pronounced improvement.
- Burst Strength: At the 30% burst retention level, life for electrical grade kraft is only 13 days versus 39 days for Edison modified kraft. Aging in oil was done at 150C.

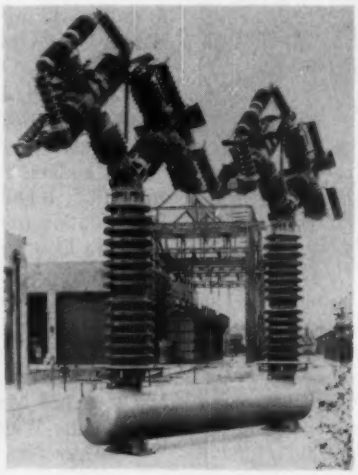
"A modified cellulose has been developed," Brummet stated, "which has improved thermal stability when aged in oil. Toughness, tensile, tear, and burst have been used as factors for evaluation under accelerated aging conditions. In all cases the improvement over electrical grade kraft is significant."

**NEW TRANSFORMER INSULATION** undergoes exhaustive testing in one of a bank of ovens at the Thomas A. Edison Research Laboratory. Research Chemist Fred S. Sadler, inventor of Edison modified kraft insulation called TherMEcel, is removing a sample so that the effects of accelerated aging may be analyzed

On the basis of its described characteristics, Edison TherMEcel provides improved thermal stability which will make possible the operation of transformers at higher temperatures, permit reduction in size and weight of transformer shells with resultant economies, and extend the life expectancy of products employing the new insulation. The new kraft insulation is produced on commercial paper-making equipment in the form of tape, paper, and board, he added.

Brummet and Fred S. Sadler, research chemist, have co-authored a formal paper on the new insulation which will be delivered soon in Detroit before the AIEE.

# EE to Build 35,000-Mva ACB's



English Electric Co will build 13 35,000-Mva air-blast frame "r" circuit breakers for Central Electricity Generating Board's new West Burton power plant in Nottinghamshire, Eng. EE says it believes the equipment, which will be worth over $4 million and will be designed for a new 400-kv supergrid, is the highest rated of its type on order anywhere. Eight of the breakers will be rated at 4,000 amp and five at 2,000 amp; power operated isolators and associated equipment will be supplied, also.

(*More News of Manufacturers, p* 110)

"Darling, George says everybody—but everybody—should be using L-M's **Duralem** ! It's really the better way. Read more about it on October 30th!"

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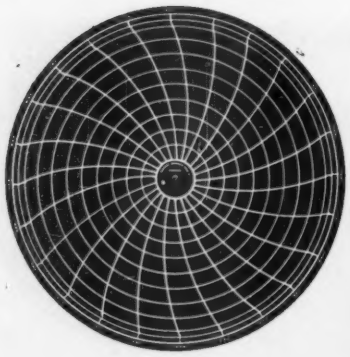

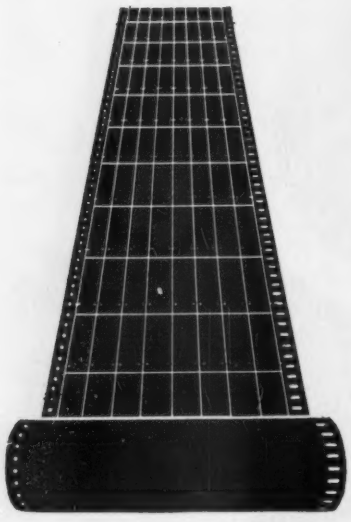

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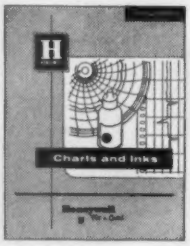


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## 65C Distribution Transformer Introduced

A new line of distribution transformers for operation at 65C rise is being readied for production at Pennsylvania Transformer Div, McGraw-Edison Co. Lighter and smaller than the company's present line, the new "Pole Star" transformers will incorporate heat-stable "TherMEcel" insulation, a major development announced (see p 108) by the Thomas A. Edison Research Laboratory.

The new transformers—to be produced in standard kva ratings—will be available in industry sizes late this year. Penn Transformer reports that extensive testing of prototype models has demonstrated low losses, low exciting current, low impedance, high overload capacity and high short-circuit strength.

Penn Transformer initiated the request that lead to the Edison Laboratories' heat-stable TherMEcel insulation project, which was sponsored by several McGraw-Edison divisions.

## New Transformer Insulation Adopted

A new distribution transformer insulation system has been announced by Line Material Industries, McGraw-Edison Co. Designated "Duralem," the new insulation will be incorporated in all 10, 15, and 25-kva production units this quarter, with other sizes following shortly.

"Duralem" insulation reportedly possesses all the properties necessary to provide a heat-resistant electrical barrier and mechanical support. Accelerated life tests showed the new paper has a good balance between the various characteristics that affect its life. L-M states that this insulation can perform effectively in transformers designed for operation at 80C hottest-spot rise. Combining this new high-temperature insulation with the new electrical characteristics of L-M's patented round-wound core and coil assembly reportedly achieves a balanced transformer design that retains its inherent high overload capacity. The new line of distribution transformers will have lower losses and improved performance.

Scientists at the Thomas A. Edison Research Laboratory developed the new insulation. L-M contributed engineering knowledge and experience, and helped sponsor the research.

# MAGNIFIED 16,000 TIMES TO MAKE SURE YOU GET MORE BATTERY POWER

This Electron Microscope at the Gould-National Battery Research Center magnifies over 16,000 times to probe the molecular structure of battery raw material.

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Gould stationary batteries are available in Plante, Calcium and Kathanode® types. Gould field engineers are ready to assist you in battery application and maintenance procedures.

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St. Paul 1, Minnesota

# Ebasco Meeting Stresses Public Relations

## Utility marketing men told public relations programs must be sound, create favorable climate for industry

Successful selling and a favorable attitude on the part of the public towards the utility industry as developed through good public relations will be the saving factors for the industry in the years to come. These points stood out at the 25th annual Ebasco Services Marketing Conference in New York last month.

While growth in consumer spending for residential use of electricity has increased some 146% in the last decade, spending for appliances has only increased 19%. Although 1960 was a particularly bad year for appliances, and so the percent increase was affected by that, appliances still lagged seriously behind other consumer spending. Chase Manhattan Bank Vice President John D. Wilson said he foresaw a 10% pick-up this year, however.

On a national scale, the economy has been moving ahead at a "fairly good pace." The Gross National Product, he said, now stands at $525-530 billion. By the middle of next year, it is expected to climb to around $565 billion.

Wilson foresaw a "fairly vigorous year" for 1962, a downturn in 1963, and then an upswing to 1965 when the GNP will be $650 billion or even higher.

If utilities get people aware of the favorable job they have done and generate self-generated earnings they will get fair rate increases, John F. Childs, vice president of Irving Trust Co, advised. Utilities can get self-generated earnings with more efficiency or profitable sales development, "but if you depend too much on rate increases (instead) the bloom is going to be off the rose."

The electric utility industry can go through a 50-100% inflation and still generate earnings, he said, and that is why investors are interested in the electric industry.

The Ebasco conference dealt hard with utility public relations.

Money spent on public relations is the thing that is going to save the industry, Childs said. "But you'll need more effort and more money spent on public relations to prevent further encroachment of public power."

Going further on this theme, Ebasco's Manager of Utility Marketing W. L. Byrne said, "Marketing's stake in public relations is the fact that successful selling and advertising efforts will mean very little unless we succeed in creating a climate of public opinion which will permit our companies to operate freely and efficiently."

The utility industry is consistent in many respects, but the manner of handling public relations is not one of them, Byrne stated.

Yet there is a unity of purpose implying ways that marketing and public relations are interdependent:

**1.** Unlike other industries, most of a utility's public is its customers. What they feel about electricity can influence their inclinations to buy more appliances, use more service, or prefer electricity to gas.

**2.** The sales department has the greatest opportunity to influence public relations, because no other department has as many varied personal contacts with customers or the general public.

There are four cornerstones of a sound public relations program, according to Ebasco's Marketing Consultant Ross Cahal.

**1.** A program to educate and motivate employees to the point where they will work constructively to improve the public's image of the company. "Research consistently shows that employees are the most powerful influence on a company's relations with the public."

**2.** A planned program of communicating with the public is necessary because, although employees are effective ambassadors, "personal contact always has to be supplemented with mass communication."

**3.** Employment of methods and techniques which will most effectively get the story to those who mold opinion and influence action —the influentials.

**4.** A consciousness of the company's responsibilities to the communities it serves and planned efforts to fulfill this.

Terming what is needed by the electrical industry in its battle with the gas industry "the anti-counter-attack," *Electrical World* Editor C. F. Hochgesang said, "an attitude of defensiveness seems to seize the electrical industry ranks when they consider some of the new aspects of gas competition."

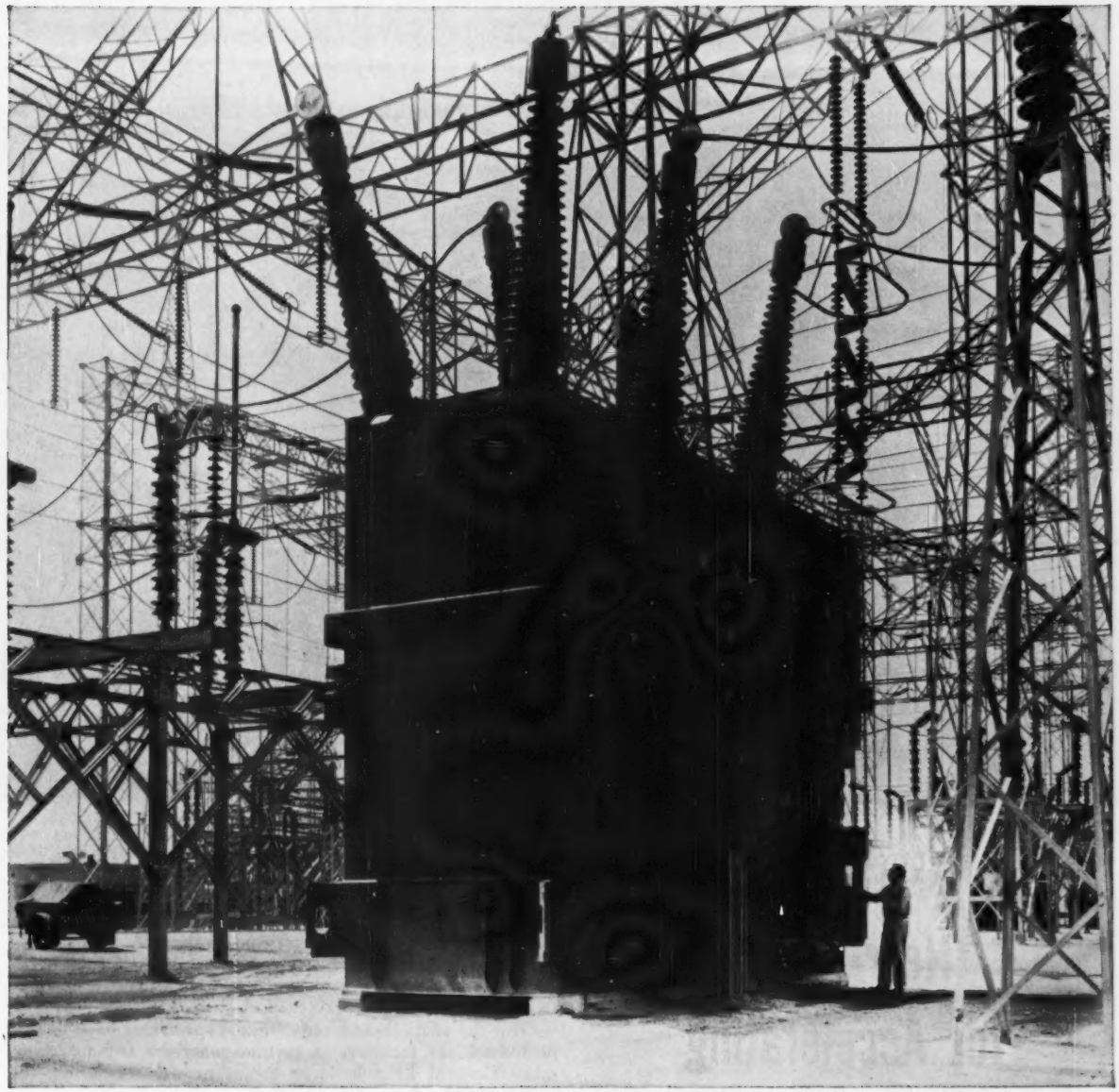
But the electrical industry has no valid reason to take a defensive attitude, he said. The industry has a product it believes in, one research says the consumer prefers to gas, one which each year slowly betters its price position, and one which will outlast gas.

One result of the electrical industry's strong space heating offensive has been the counter-attack of the gas industry on the residential and commercial lighting and motor load through the natural gas turbine installations.

But they must either price the service so attractively the prospect can't resist the bargain, or guarantee or otherwise underwrite the price in such a way that the customer risk will be minimized or eliminated.

Still, expect the gas industry to see these ventures as a form of risk investment, Hochgesang said. Looked at in this light, "it should be possible for us to avoid a defensive attitude, to adopt the tenet that it is the gas companies who are counter-attacking."

General Electric Co Vice President Harold F. Smiddy urged, "Pattern your sales techniques on the highly creative selling practices of the 1930's." Technological changes, the exploding and changing population patterns and the expanded purchasing power provide new and real opportunities for greater sales of utility service, Smiddy added.



# UNIVOLT® 35 TRANSFORMER OIL STARTS DRY AND STAYS DRY!

Small traces of moisture – as little as 0.03 to 0.05% – can seriously impair the dielectric strength of an insulating medium. That's why Univolt 35 transformer oil is passed through blotter presses to assure complete dryness before shipping... packaged in sealed containers to prevent the entrance of moisture... loaded *indoors* in specially prepared tank cars never used for any other purpose. In service, Univolt 35 resists emulsification from any moisture which may enter the transformer.

Univolt 35 offers excellent dielectric strength and low power factor. Free from acids, alkali and corrosive sulfur, it resists oxidation and will not attack the varnish finish on coils. Its high-temperature stability makes it particularly valuable during peak summer loads. Univolt N-36 has the same characteristics, plus an effective oxidation inhibitor.

**TERESSO®** premium-quality turbine oils are triple inhibited for protection against rust, foaming and oil breakdown. Your Esso Representative, backed by a system of Sales Service Laboratories, can help you pick the right product for every purpose. Give him a call, or write to us at: 15 West 51st Street, New York 19, N.Y.

HUMBLE OIL & REFINING COMPANY

General Electric's new Materials and Processes Laboratory at Schenectady, N. Y.

# New Home for Accelerating Turbine-Generator Technology

The Large Steam Turbine-Generator Department's new Materials and Processes Laboratory is nearing completion. Before the end of this year it will become the new home for 200 engineers, scientists, and technical specialists working on applied research, development, and evaluation of materials and processes in—chemistry and insulation, metallurgy, welding, mechanical engineering, and non-destructive testing.

Over the years these highly trained specialists have helped push back the frontiers of turbine-generator technology to make General Electric large steam turbine-generators the standards of the industry in efficiency and reliability.

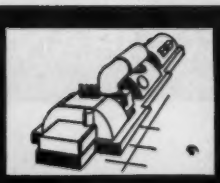
The original M&P Lab, with its staff of but 3 engineers, dates back to 1894. Time and again the scope of its scientific investigations has been expanded as the need for knowledge and progress has grown in such fields as steam turbine-generators, gas turbines, motors, and generators.

Steady advances in technology are not mere coincidence. And neither are the quality and service "added values" that keep General Electric turbine-generators on-the-line at top operating efficiency year after year. 244-11

*Progress Is Our Most Important Product*

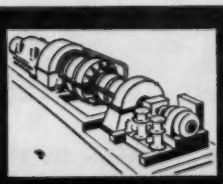
GENERAL ELECTRIC

*General Electric Turbine-Generators Help Keep Power Costs Low*

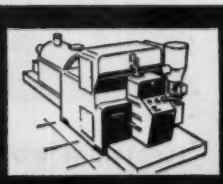


Steam turbine-generators for large blocks of power

Steam turbine generators 100,000 kw and lower



Gas turbines for peaking, base load, combined cycles



Mechanical drive steam turbines for auxiliaries

Electrical World

OCTOBER 23, 1961

## Management Newsletter

# High Profits May Boost Capital Spending

**The economy is clearly in an expansionary phase.** But will the rate of expansion slow to a halt, or will business activity continue to grow to boom proportions? This is the question that business executives are asking as they plan their 1962 budgets.

**As of yet, there's no hard answer to this question.** Economic indicators are mixed. Some are climbing upward, like gross national product and the industrial production index. Others are sluggish—retail sales, for example (EW, Sept. 25, p 75).

**From the McGraw-Hill department of economics** comes a forecast that adds new punch to the optimistic side of the ledger. This is the department's look at corporate profits for the remainder of this year and for 1962. The forecast points to record levels of profit and cash flow for American industry. And, if it turns out to be accurate, then there should be quite a bundle of cash available for purchases of new plant and equipment.

**Capital spending hasn't been lingering** in a depressed state. Quite to the contrary, it has turned up since the trough of the recession and has moved right along with the recovery. Expenditures for new plant and equipment were at $33.5 billion in the second quarter of this year, but then bounced back to $34.8 billion in the third quarter. Estimates for the fourth quarter, based on anticipated capital expenditures as reported by business in late July and August, run at $35.9 billion. If this estimate turns out to be accurate, it will mean a $2.4-billion pickup from the low point.

**This rate of gain is probably sufficient** to support the expansion of the economy. But a really big boom would require an even faster rate of capital expenditures. The McGraw-Hill forecast of corporate profits indicates that such a boost in capital spending may be ahead.

**By year end,** the economics department expects corporate profits to be the highest in our history. Where are all the profits coming from? Take a look at the current business situation. The third-quarter dollar volume of total national output topped $525 billion (annual rate) compared with $501 billion in the first quarter. This quarter it will run about $540 billion. The Federal Reserve Board's industrial production index averaged 113 (1957 = 100) in the third quarter compared with a recession low of 102 last February. The output index is now well ahead of the previous peak reached in January 1960.

**The industrial operating rate has bounced back** to about 84% compared with less than 75% at the bottom of the recession. This indicates that the rate of capacity utilization of manufacturers will soon pass the 85% mark.

**In the three earlier postwar business recoveries,** total corporate profits rose an average of 31% along with an average gain of 11% in industrial production during the first nine months of recovery. This breaks down to an increase of 2.8 points in profits for every one point gain in production. If this 2.8-to-1 relationship were to hold this time, a 15-point increase in output from the first to the last quarter of this year would result in a 40% increase in profits with profits running at a rate of $55 billion.

**A contributing factor to rising profits** is the sizable increase in manufacturing productivity which has taken place since February. Increases in productivity contribute substantially to profits. The gain between February and September in output per manhour is estimated at approximately 5%. During the same period, hourly earnings of production workers have jumped only 3%. This means that output has been rising much more rapidly than labor costs—another way of saying that unit labor costs have been dropping.

**Material costs are not likely to run away either.** The sensitive industrial price barometers have not yet started to move up. Generally, there is a considerable time lag between movements of the sensitive price indexes and the more comprehensive and slower moving indexes. Thus, we still have quite a way to go before industrial prices will begin to move up at an inflationary pace.

**Putting all these factors together,** the McGraw-Hill department of economics sees corporate profits before taxes looking like this:

| | (annual rates) | (billions of dollars) |
|---|---|---|
| 1961 | 1st Quarter | 39.6 |
| | 2nd Quarter | 45.2 |
| | 3rd Quarter* | 47.5 |
| | 4th Quarter* | 52.0 |
| 1962 | 1st Quarter* | 55.0 |
| | 2nd Quarter* | 57.0 |
| | 3rd Quarter* | 56.5 |
| | 4th Quarter* | 55.5 |

* estimated

**If we accept these figures** for before-tax profits, then next year's after-tax profits are likely to be the best in some time. And corporate cash flow (retained earnings plus depreciation) provides an even more encouraging picture. Here's how the cash flow figures could line up for this year and next compared with the record of the last five years:

## Cash Flow of American Corporations

(Billion $)

| | 1956 | 1957 | 1958 | 1959 | 1960 | 1961* | 1962* |
|---|---|---|---|---|---|---|---|
| Profits after taxes | 23.5 | 22.3 | 18.8 | 23.7 | 22.7 | 23.3 | 28.3 |
| Dividends | 12.1 | 12.6 | 12.4 | 13.4 | 14.1 | 14.3 | 14.7 |
| Retained earnings | 11.4 | 9.7 | 6.4 | 10.3 | 8.6 | 9.0 | 13.6 |
| Depreciation | 17.5 | 19.3 | 20.6 | 21.8 | 23.3 | 24.5 | 25.7 |
| Total Cash Flow | 28.9 | 29.0 | 27.0 | 32.1 | 31.9 | 33.5 | 39.3 |

* estimated

**As the table shows,** the amounts available from internal corporate funds this year for new plant and equipment expenditures are larger by far than at any time in our history. With this kind of cash in the till, financing new plant and equipment will be a smaller obstacle to corporate spending than it has been in the past.

**But the availability of funds is not the only incentive** to capital spending. The real need of many American industries to modernize is just as important. US manufacturers have been viewing with concern the modern, highly automated plant which Europe has been constructing since the war. And they realize fully that many of America's plants, built during the war, are not at all competitive. So, even with excess capacity, it seems likely that many firms will use the high cash flow to bring old facilities up to modern levels of efficiency.

**It's harder to make a good case** for large-scale investment in new facilities with manufacturing operations still running an average of ten points below the rate of capacity utilization which manufacturers prefer. But an 85% operating rate, which will probably be a reality before the year is over, may well be the signal for manufacturers to step-up investment for new capacity.

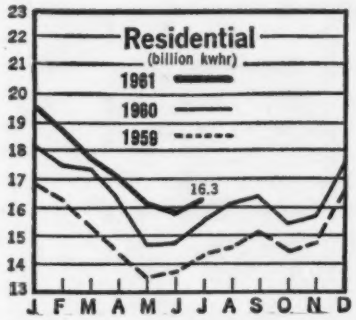
**How much of an increase can we expect?** The McGraw-Hill department of economics can't put a precise figure on it until it completes its current survey of business plans for new plant and equipment. But the department has reason to think that the increase will be substantial. This is the trend traced by the McGraw-Hill index of machinery new orders. The quarterly forecast completed in July suggested about a 10% increase in machinery new orders next year.

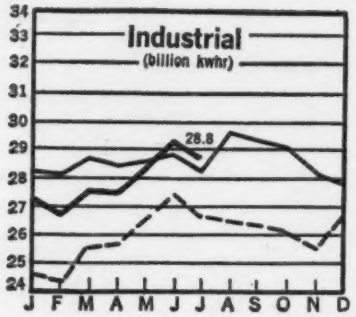
**Actual incoming new orders have risen steadily** since early this year with the August index reaching an all-time high. Capital goods producers booked new orders at a higher rate in the third quarter than they had anticipated. Add on to this the step-up in defense outlays, and the bright outlook for profits, and 1962's capital spending may go well beyond the 10% increase which the July survey indicated.

**But not all forecasts for capital spending are quite so optimistic.** Some economists are resting their cases on the sluggishness of consumer spending and the present overcapacity of American plant. And they doubt whether a significant jump in spending for new plant and equipment is in the cards.

**If, however, the profit picture is anything like the estimates shown,** it's certain that US manufacturers will have quite a bit of cash lying around. And they are impressed with the need to modernize their facilities. Only a pessimistic business outlook would persuade them to leave that cash idle. And right now, the weight of economic indicators leans away from that kind of pessimism.

## Monthly Sales of Electricity . . . through July



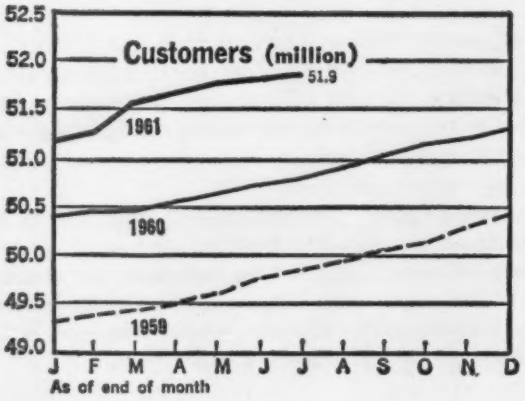

SOURCE: EDISON ELECTRIC INSTITUTE

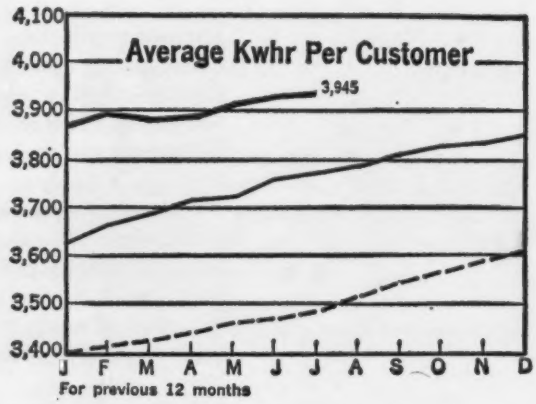
## Power Statistics . . . through July

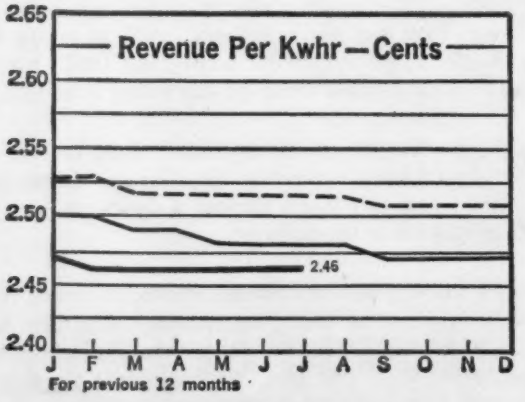
| | Latest Month | Years Ago | Annual Change % |
|---|---|---|---|
| Capacity . . . million kw | 176.04 | 162.83 | 8.1 |
| Production . . . billion kwhr | 68.20 | 63.53 | 7.4 |
| Hydro | 13.50 | 11.89 | 13.5 |
| Fuel | 54.70 | 51.64 | 5.9 |

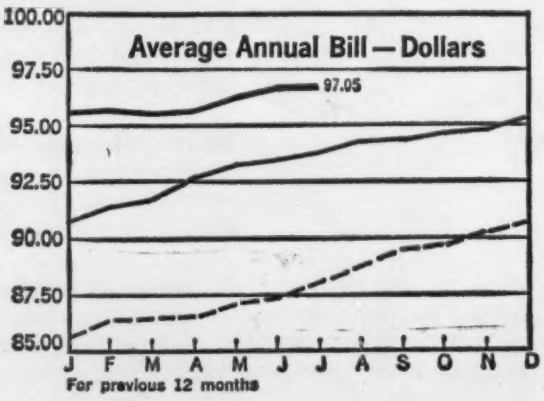
SOURCE: FEDERAL POWER COMMISSION

## Residential . . . through July




SOURCE: EDISON ELECTRIC INSTITUTE

# UNI/DYNE TURRET™ giant in strength, compact in size, exclusive with PITMAN

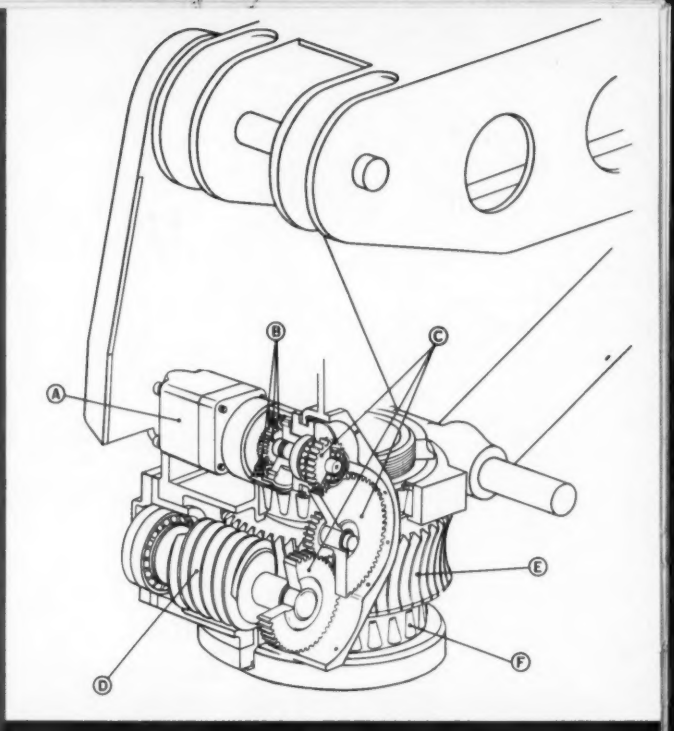
Now—out of the same dynamic atmosphere which produced the famous Pitman Polecat—comes an utterly new concept in creative engineering . . . the Uni/Dyne Turret, now provided as standard equipment on all Polecat models.

Pitman engineered the Uni/Dyne Turret to meet the ever-increasing list of job requirements for lifting and digging equipment and to provide the industry's standard for years to come. For the first time, a rotation system has been designed specifically for the job to be done. It obsoletes all competitive equipment.

Uni/Dyne Turret is extremely compact, enables Polecat unit to be mounted virtually *anywhere* on a utility line truck—new or in-use. Rotation gear system and hydraulic motor to run it are completely contained within the turret—there are no chains, sprockets, exposed gears, cables, or other compromises. Rotation locks instantly when power is removed, provides rigid base of operations.

Pitman Polecats, with exclusive Uni/Dyne Turret, are available in center-mount, corner-mount and top-mount models, and new top-mount model with operator seat. Turn this page for details.

™




Note the clean, uncluttered design of Pitman's Uni/Dyne Turret! There are no exposed hydraulic hoses to snag. The turret-housing is a stress-relieved steel casting, which provides additional metal at points of strain. With all of its strength, Uni/Dyne is more compact than other turrets on the market; it installs even on a corner-mount, which requires only 14" of space. Its maximum over-all height is only 32". Uni/Dyne rotates 375° in either direction. Entire rotation system is enclosed, and operates in a bath of oil.

Hydraulic motor (A) operates planetary gear system (B), driving spur gear train (C), which turns worm (D) around main worm gear (E), providing rotation of entire unit. Tapered roller bearings (F) provide maximum load-carrying capabilities. Worm and worm gear lock instantly in case of power loss, preventing any boom rotation until power is re-applied; this self-locking rotation mechanism provides a rigid base for digging under tough conditions . . . lifting heavy loads precisely . . . raising men and tools aloft.

## NOW, ALL POLECAT™ MODELS FEATURE

# UNI/DYNE TURRET™ BY PITMAN

*. . . leader in development of new hydraulic lifting and digging equipment*

Uni/Dyne is standard equipment on all corner-mount, center-mount and top-mount Pitman Polecats. If you'd like to see one, your Pitman Utility Dealer will be glad to oblige with a thorough demonstration. Or, simply contact . . .

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# News About People

## General Public Utilities Picks VP

KUHNS ▶

William G. Kuhns has been elected vice president of General Public Utilities Corp. H. A. Busch and E. W. Morehouse retired as vice presidents.

Kuhns has been serving GPU as secretary and treasurer. He joined the corporation in 1955. Before that he was associated with Wisconsin Electric Power Co as supervisor of the utility's tax division.

R. H. Schutt was named to succeed Kuhns as treasurer, and W. E. Warner replaced Kuhns as secretary.

## Kelley Steps Into Illinois Power Vice President's Post

KELLEY ▶

Illinois Power Co has promoted Wendell J. Kelley to a vice presidency. He will continue as manager of personnel, a post he has held for the past two years.

Kelley joined Illinois Power in 1949 as an assistant engineer. From 1952 to '54 he was assistant to the manager of electrical operations. In 1954 he became system operating engineer, and in '55 was named assistant to the vice president. He became personnel manager in 1959.

## Monongahela Power Promotes Scheerer to Vice Presidency

Paul J. Scheerer has become a vice president of Monongahela Power Co. He is coordinator in the executive department at the Fairmont, W. Va., general offices.

Scheerer came to Monongahela in 1929 after serving with General Electric Co. He started as an estimator and became a junior engineer later that year. He was promoted to superintendent of division engineering in 1953, was named assistant manager of transmission and distribution in 1954, and became a member of the executive staff this year.

◀ SCHEERER

## B&W Has Rowand Head Boiler Division Marketing Group

ROWAND KESSLER

Babcock & Wilcox Co has established a marketing department within its boiler division. W. H. Rowand was named vice president in charge of the new department. G. W. Kessler was chosen to succeed Rowand as head of the engineering department.

Rowand began with the B&W boiler division in 1929 as a student engineer. He rose through the ranks and became vice president in charge of engineering for the division in 1953.

Kessler, who joined the company in 1930, has served as chief engineer of the boiler division since 1954.

*(More News About People on next page)*

# Edmondson Chosen to Become CEMA President

EDMONDSON

Thomas Edmondson has been elected president of the Canadian Electrical Manufacturers Assn at the group's 17th annual meeting.

President of Ferranti-Packard Electric Ltd, he originally joined the predecessor of the present company. He worked his way up through the ranks, becoming secretary-treasurer in 1936. Edmondson served one year as executive vice president for the company before being promoted to president in 1951.

## Two From Communications Division Are Named Motorola VPs

Motorola Inc has elected Homer L. Marrs and William J. Weisz as vice presidents. Marrs became vice president-sales and Weisz became vice president-communications products, both for the communications division.

Marrs has been with Motorola and the communications division for 23 years, most recently as the division's national sales director.

With the company since 1948, Weisz has been manager of mobile and portable communications products for the division since 1958.

MARRS WEISZ

### Bechtel Moves Garbarini To San Francisco Office

Bechtel Corp has transferred Vice President Edgar J. Garbarini from Vernon to San Francisco, to take charge of all engineering and construction activities of the power and industrial division, with the exception of the hydro department. I. R. Caraco was named area manager in charge of operations of the Vernon office.

GARBARINI CARACO

### Dunham Is Manager of New Utility Products Division

Anaconda Wire & Cable Co has established a utility products division with Austin W. Dunham as manager. The new division will be responsible for marketing Anaconda's line of utility products.

DUNHAM

Dunham, the manager of utility sales since last year, joined the company in 1932.

### Sevigny Gets Marketing Post at Federal Pacific

Joseph A. Sevigny has been named marketing manager for power capacitors at Federal Pacific Electric Co. He will supervise sales and promotion for the firm's new line of "Tiny Tim" power capacitors and other important new developments in the field.

Sevigny has been capacitor applications engineer for over two years with Federal Pacific and with Cornell-Dubilier before that firm became part of Federal Pacific.

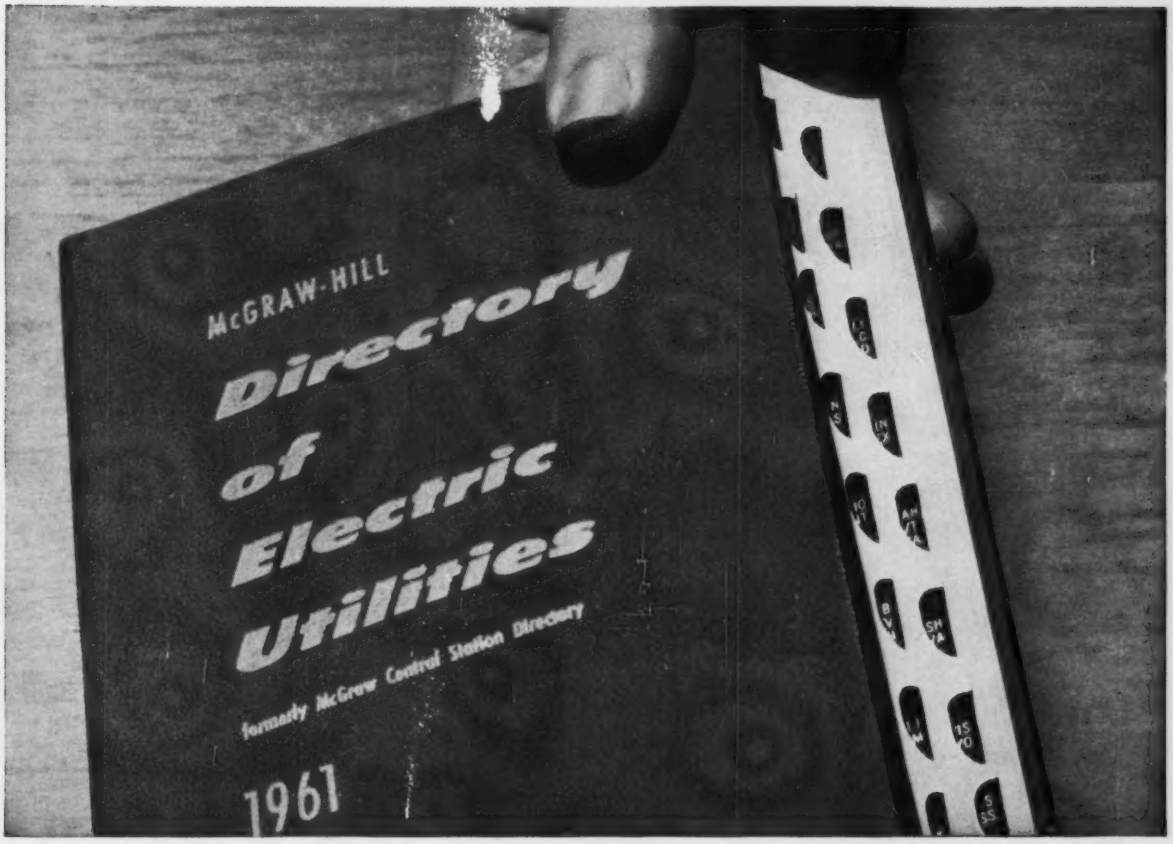
### McGraw Contractors Award Is Presented to Moseley

Charles W. Moseley has received the Contractors Medal and Purse, presented under the James H. McGraw Award for Electrical Men, at a recent National Electrical Contractors Assn meeting in Washington, D. C.

Moseley, of R. H. Bouligny, Inc, of Charlotte, N. C., received the award for efforts in planning and promoting the organization of line construction contractors in effective regional chapters.

### Greenewalt to Get Medal

Crawford H. Greenewalt, president of E. I. du Pont de Nemours & Co, will be the 1962 recipient of the John Fritz Medal for contributions "in the translation of research achievements by way of sound engineering into useful products . . ." The award will be presented Dec. 5 during the American Society of Chemical Engineers' annual banquet at New York's Commodore Hotel.

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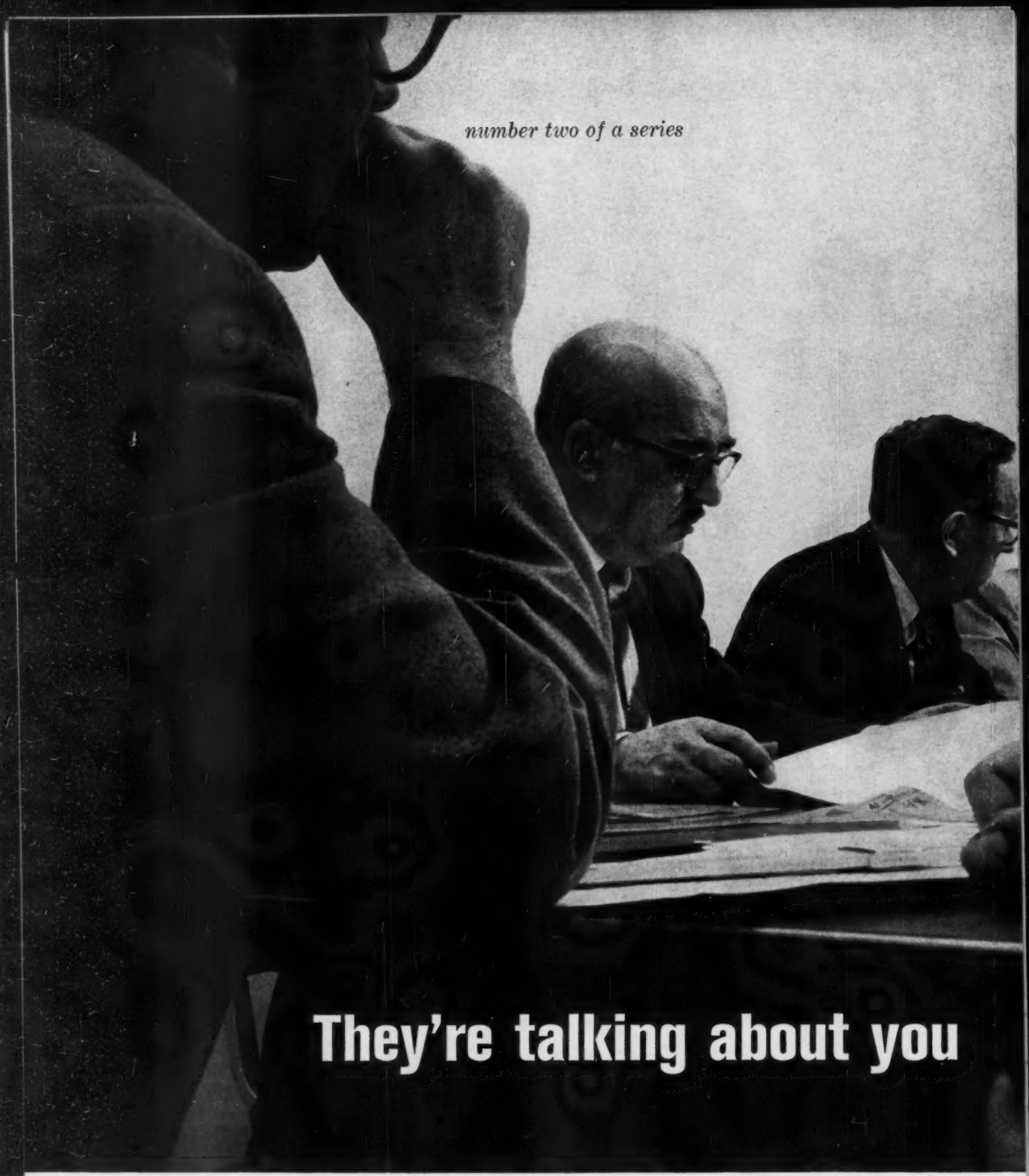

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Provide an indexing or subject word.

Write it as the first word of your ad.

If it is a Position Wanted or Position Vacant ad, make the first word the kind of position sought or offered.

This will assure proper classification in the column.

The right is reserved to reject, revise or properly classify all Want Advertisements.

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**Permanent openings for Resident Engineers** experienced in supervision of construction of high-voltage transmission lines. Degree and registration desirable. Excellent opportunity with consulting engineering firm. Please send resume of education, experience and salary requirements to P-7677, Electrical World.

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*"Put Yourself in the Other Fellow's Place"*

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**TO EMPLOYEES**

Letters written offering Employment or applying for same are written with the hope of satisfying a current need. An answer, regardless of whether it is favorable or not, is usually expected.

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**MR. EMPLOYEE** you, too, can help by acknowledging applications and job offers. This would encourage more companies to answer position wanted ads in this section. We make this suggestion in a spirit of helpful cooperation between employers and employees.
This section will be the more useful to all as a result of this consideration.

Classified Advertising Division

**McGraw-Hill Publishing Co., Inc.**
330 West 42nd St., New York 36, N. Y.

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4—2500 KVA W-H 34500—2400/4160Y
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
3— 500 KVA A-Ch 2400/4160Y—240 x 480
3— 500 KVA A-Ch 7200/12470Y—240 x 480
3— 500 KVA A-Ch. 13200—240 x 480
3—1000 KVA G-E 34500-7200/12470Y
3—1000 KVA Wag. 34500—2400/4160Y
3— 833 KVA W-H 43800—480
3— 500 KVA Penn. 13200—120/240
3— 333 KVA W-H 13200—2400/4160Y
3— 500 KVA A-Ch. 13800—240 x 480
3— 333 KVA Wag. 2400—120/240
1—1500/1875 KVA Mol. 3-Ph. 34,500—2400 F/C equipped

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### U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-5685) will be received at Denver, Colorado, until 2 p.m., Mountain Standard Time, November 28, 1961, for furnishing generator-voltage bus structure and switchgear assemblies for Spring Creek Powerplant, Central Valley Project, California. Delivery is desired within 330 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 25, Colorado. Floyd E. Dominy, Commissioner.

# Meetings Calendar

## NOVEMBER

• **Area Power Conference**—Sponsored by Dakotas Electric Co-op, Inc, Northern States Power Co, Manitoba Hydro-Electric Board, Minnkota Power Co-op, Inc, Otter Tail Power Co, Montana-Dakota Utilities Inc, and Central Power Electric Cooperative, Inc, Minot, North Dakota, Nov. 1-2.

**NEMA**—Wire & Cable Division, Seaview Country Club, Absecon, N. J., Nov. 1-3; Industrial Equipment Division, Edgewater Beach Hotel, Chicago, Nov. 1-8; Codes & Standard Committee, NEMA Office, New York City, Nov. 9-10; Lighting Equipment Division Meeting, Belmont Plaza Hotel, New York City, Nov. 13-15; Annual Meeting, Plaza Hotel, New York City, Nov. 16; Generation, Transmission & Distribution Equipment Division, Shoreham Hotel, Washington, D. C., Nov. 27-29.

• **Electric Council of New England**—Fall Meeting of Electrical Systems and Equipment Committee, Motel 128, Dedham, Mass., Nov. 2-3.

**National Rural Electric Cooperative Association**—Region Eight Meeting, New Orleans, La., Nov. 2-3; Region Nine Meeting, Sacramento, Calif., Nov. 6-7.

• **Public Utilities Advertising Association**—Region 4 Meeting, Indianaoplis, Indiana, Nov. 2-3; Region 2 Meeting, Hershey, Penn., Nov. 30-Dec. 1.

**Southeastern Electric Exchange**—Personnel Administration Section, Tampa Section, Tampa International Inn, Tampa, Florida, Nov. 2-3; Sales, Advertising & Public Relations Conference, Tides Hotel, St. Petersburg, Florida, Nov. 15-17.

**American Institute of Electrical Engineers**—Western Appliance Technical Conference, Biltmore Hotel, Los Angeles, California, Nov. 6; AIEE-IRE 6th Annual Technical Conference on Non-Linear Magnetics, Statler-Hilton Hotel, Los Angeles, California, Nov. 6-8; Magnetism and Magnetic Materials Conference, Westward Ho Hotel, Phoenix, Nov. 12-16.

• **Edison Electric Institute**—Sales Personnel & Training Committee, New York City, Nov. 6-7; Accident Prevention Committee, Tutwiler Hotel, Birmingham, Alabama, Nov. 6-8; Commercial Cooking & Water Heating Committee, New York City, Nov. 8-9; Area Development Workshop, Miami, Florida, Nov. 14-15; Commercial Lighting Committee, Rochester, New York, Nov. 27-28; Electric Space Heating & Air Conditioning Committee, Pittsburgh, Penn., Nov. 30-Dec. 1.

• **Tennessee Valley Public Power Association**—Distribution Practices Section Meeting, Hotel Noel, Nashville, Tenn., Nov. 6-7; Accounting Section Meeting, Hotel Farragut, Knoxville, Tenn., Nov. 13-14.

• Additions this week.

## Letters (*Continued from page 5*)

River to the International Electrical Exposition at Frankfurt, about 110 miles. This 15,000-v line was first energized on September 12, 1891.

To return to the original point, we have no motive or desire to negate the acclaim being accorded to the Adams plant; perhaps as seems likely, legitimate historical claims can be made for it. We feel on the contrary that it would actually cheapen this acclaim to allow it to become entangled with the claims and counterclaims of engineering "first" which usually represent the practical application of the work of many men . . . more often than not in many countries.

Thomas E. Lucier
Manager of Advertising and Public Relations
Brown-Boveri Corp, New York, N. Y.

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